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8. ABSTRACT

Samples of benthic invertebrates were collected during 1980 by divers from 86 stations in the nearshore zone (depths of 5-20m) of Lake Huron, Georgian Bay and North Channel. Six general categories of substratum were encountered: rock, gravel, hard clay, sand, silt/sand and silt. Abundance of invertebrates varied with depth and substratum, ranging from 456m^{-2} to 45701m^{-2}. Clay and gravel usually supported the largest populations, rock the smallest. A total of 218 taxa were recognized, including a first record of the naidid, Ripistes parasitica. With only a few exceptions, individual taxa were distributed throughout the study area. The most abundant groups were Nematoda, Oligochaeta, Mollusca and Chironomidae. Ephemeroptera and Trichoptera occurred at 83% of 5 and 10m stations. Ordination analysis failed to define distinctive communities which could be related to environmental parameters such as depth or substratum, except that a low-density assemblage of nematodes, worms and Pontoporeia was found at deep, silty stations in North Channel.

Comparison of these results with those of earlier studies illustrated the much greater efficiency achieved through direct sampling by divers. Estimates of invertebrate standing stocks were about an order of magnitude greater in the present survey and the variety of organisms was much greater since all substrata could be sampled.

There was no indication of increased eutrophication or unusual environmental stress within the study area. This study is the most comprehensive survey to date of the nearshore zone of any of the Great Lakes and will serve as a baseline against which the other lakes and future changes can be compared.

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FOREWORD

The monitoring and analysis of benthic invertebrates along the Canadian coastal zone of Lake Huron, Georgian Bay and the North Channel was carried out in 1980 under contract to Dr. David R. Barton of the University of Waterloo. It is the most comprehensive survey to date of the nearshore zone of any of the Great Lakes and will serve as a baseline against which other lakes and future changes in environmental conditions can be assessed.

This study, part of the Ministry's contribution to the Great Lakes International Surveillance Program (GLISP), fills a major gap in knowledge of the ecology of Lake Huron and its largest subdivisions, Georgian Bay and North Channel, with respect to the actual enumeration and identification of benthos from a wide range of bottom substrate types.

Airlift sampling employing divers rather than Ponar grabs was found to best reflect the actual population of benthos since samples were easily obtained from the wide range of often coarse sediments.

This project was undertaken as part of the Canada-Ontario Agreement on Great Lakes Water Quality and as such received federally assisted funding.

DISCLAIMER

This report has been reviewed by the Great Lakes Section, Water Resources Branch, Ontario Ministry of the Environment and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Ontario Ministry of the Environment.

THE NEARSHORE BENTHIC INVERTEBRATES OF LAKE HURON, GEORGIAN BAY AND NORTH CHANNEL

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ABSTRACT

Samples of benthic invertebrates were collected during 1980 by divers from 86 stations in the nearshore zone (depths of 5-20m) of Lake Huron, Georgian Bay and North Channel. Six general categories of substratum were encountered: rock, gravel, hard clay, sand, silt/sand and silt. Abundance of invertebrates varied with depth and substratum, ranging from $456m^{-2}$ to $45701m^{-2}$. Clay and gravel usually supported the largest populations, rock the smallest. A total of 218 taxa were recognized, including a first record of the naidid, Ripistes parasitica. With only a few exceptions, individual taxa were distributed throughout the study area. The most abundant groups were Nematoda, Oligochaeta, Mollusca and Chironomidae. Ephemeroptera and Trichoptera occurred at 83% of 5 and 10m stations. Ordination analysis failed to define distinctive communities which could be related to environmental parameters such as depth or substratum, except that a low-density assemblage of nematodes, worms and Pontoporeia was found at deep, silty stations in North Channel.

Comparison of these results with those of earlier studies illustrated the much greater efficiency achieved through direct sampling by divers. Estimates of invertebrate standing stocks were about an order of magnitude greater in the present survey and the variety of organisms was much greater since all substrata could be sampled. There was no indication of increased eutrophication or unusual environmental stress within the study area. This study is the most comprehensive survey to date of the nearshore zone of any of the Great Lakes and will serve as a baseline against which the other lakes and future changes can be compared.

INTRODUCTION

Despite the development of an extensive literature in the last two decades describing the benthic fauna of the Great Lakes, the nearshore zone has been largely neglected. This has been due to the lack of satisfactory methods for obtaining samples of benthic animals from the wide range of often coarse sediments found at depths of less than 20m. This study was undertaken as a first step toward filling this major gap in our knowledge of the ecology of Lake Huron and its largest subdivisions, Georgian Bay and North Channel. The problem of sampling was solved by employing divers rather than less versatile grabs or dredges.

This report details the results of a nearshore survey conducted in early autumn 1980. It is not a complete description of the biology of this complex and dynamic portion of the Great Lakes, but still constitutes the most detailed and comprehensive survey available to date. It is hoped that these results will prompt further studies of nearshore processes and serve as a baseline against which any future changes in the condition of Lake Huron can be assessed.

METHODS

The locations of sampling transects are shown in Figs. 1 and 2. Transects H17, G26, G27 and all North Channel stations were sampled between 24 September and 7 October 1980, by Laidlaw (1980). The remaining transects were sampled by Bio-Environmental Services, Ltd. (1981) between 19 September and 17 October 1980.

Stations were selected at depths of 5, 10 & 20m along each transect except those in shallow or narrow parts of bays (e.g. G14A, G14C, G15A, G15C, NA, NB). Divers collected 3 samples at each station. On silt or sand a plastic tube (10 cm inside diameter) was pushed by hand up to 20cm into the bottom, capped, removed from the sediment and capped on the lower end before being carried to the surface. Each core of sediment was washed through a sieve (200µm apertures) and the residue was preserved with 10% formalin. On rocky substrata samples were collected with an airlift simila to that described by Barton and Hynes (1978) equipped with a 200µm mesh collecting bag. The area sampled was defined by a section of coring tube held firmly against the bottom. These samples were also preserved immediately in 10% formalin. The divers noted the nature of the substratum at each station as proportions of rock, gravel, sand, clay or silt.

Invertebrates were sorted from the samples with the aid of a dissecting microscope by Bio-Environmental Services, Ltd. (1981). Microcrustaceans (Copepoda, Cladocera, Ostracoda) were not removed from the residues.

All animals were identified to the lowest practical taxonomic level (see Appendix A). Oligochaetes were mounted on slides in polyvinyl lactophenol and allowed to clear before being examined. In the case of a few samples which contained very large numbers of worms, a random subsample of at least 100 individuals was examined. Identification of molluscs was hampered by extensive decalcification caused by the use of unbuffered preservative.

All sample counts were $\log_{10}$-transformed before calculating 95% confidence limits (Elliott 1977). Ordinations were performed using the University of Waterloo computer system with an ordination package (ORDIFLEX) by Gauch 1977).

RESULTS

The 218 taxa identified from the benthic collections taken during this survey are listed in Appendix A. Appendix B lists the complete contents of each sample; individual counts may be converted to individuals m^2 by multiplying by 127.3.

Six general types of substratum were encountered in the study area: rock (including boulders and exposed bedrock), gravel, hardclay, sand, silt/sand and silt (Table 1). Hard clay was found only at G5-20, N18-5 and N18-10. Gravel was sampled only at Lake Huron and Georgian Bay stations. Other substrata were encountered throughout the study area and at all depths.

Mean total standing stocks of invertebrates ranged from 456 m^{-2} at Station N12-20 to 45701 m^{-2} at G2-20. With the exception of uniformly low standing stocks at depths of 20m in North Channel, there were no general trends in the distribution of total abundance of invertebrates, either by region or depth (Figs. 3 & 4). This seemed to be due to the variable relationship between total numbers and substrate and depth (Table 2). Abundance was similar at all depths on gravel and decreased with increasing depth on silt. On rock and clay standing stocks were similar at 5m and 10m, but lower at 20m. Significantly more animals were collected at 10m than at 5m or 20m on sand. On silt/sand total numbers were significantly lower at 10m. Total numbers of invertebrates were extremely variable but, in general, clay and gravel supported the largest standing stocks and rock the smallest.

The mean numbers of taxa $sample^{-1}$ showed similar trends with depth on the different substrata (Table 3). The only difference in the general pattern was that there was no significant change in the number of taxa at different depths on sand. Hard clay supported more taxa at depths of 5m and 10m than any other substratum, although it should be emphasized that clay was sampled only at one station at each depth. The greatest variety of animals at 20m was found on silt/sand and gravel.

The five stations on Transect G16, located at depths of 1-2m on The Mary Ward Shoal, supported benthic communities which were similar to those found on the same substrata at 5m stations. Standing stocks followed the same general relationship with substrate, ranging from 1400m^{-2} on rock to an average of 23478 on gravel (Fig. 4a).

Qualitatively, the fauna of the nearshore zone was fairly homogeneous throughout Lake Huron, Georgian Bay and North Channel. The 15 stations in Lake Huron yielded a total of 126 taxa, 172 taxa were collected from 42 stations in Georgian Bay, and the 28 stations in North Channel supported 147 taxa. With only a few exceptions, animals which were found at 5 or more stations were also found in each region, i.e. common species were common throughout the study area. Noteworthy exceptions include Manayunkia speciosa and Crangonyx gracilis which were not found at any Huron station. Gammarus pseudolimnaeus and Asellus intermedius were not collected in North Channel, but Hexagenia spp. were found only there. Most larval Chironomidae were early instars which could not be assigned to species so specific distributions remain in doubt.

The species collected during this survey include a number of new records of Oligochaeta for Lake Huron. These include Peloscolex curvisetosus, Tubifex ignotus, Piquetiella michiganensis, Pristina longiseta and Ripistes parasitica. The specimens of R. parasitica found on transect NA are apparently the first reported from the western hemisphere (J.K. Hiltunen, pers.comm.).

The most abundant elements of the nearshore benthic fauna were Nematoda, Oligochaeta, Mollusca and Chironomidae. Amphipods, Pontoporeia hoyi at 20m and mainly Hyalella azteca at shallow stations, were abundant at only a few stations in Lake Huron and North Channel. Insects other than chironomids, mainly Ephemeroptera and Trichoptera, were collected at 83% of all stations at depths of 5 and 10m and 33% of all 20m stations.

The depth and substrate preferences of the most common taxa (those found at 15 or more stations) were examined by comparing frequencies of occurrence at 3 depths and mean abundances on the various substrata. Deepwater (20m) forms found in approximately equal numbers on all substrata included Stylodrilus herringianus, Vejdovskyella intermedia, Procladius and Monodiamesa spp. Peloscolex ferox was collected most frequently at 20m and seemed to avoid gravel. Pontoporeia hoyi was most abundant on gravel, sand or silt at 20m. Stylaria lacustris and Heterotrissocladius spp. were found most frequently at 10m and 20m with the former being most abundant on rock and the latter showing no clear substrate preference.

The largest populations of Cryptochironomus, Cryptotendipes and Tanytarsus were sampled at 5m on gravel and silty sand, but each was most frequently collected at 10m. The following taxa were collected on various substrata at about equal frequencies at depths of 5m and 10m: Potamothrix vejdovskyi, Ephemera simulans, Microtendipes spp., Polypedilum scalaenum and Cladotanytarsus - gravel; H. azteca and Pseudosmittia-gp. - rock; Ablabesmyia, Pseudochironomus spp. and Piquetiella michiganensis - rock and gravel.

Caenis and Thienemannimyia - gp, were most common and abundant on rock and gravel at 5m. Other taxa which were most frequently collected at 5m either showed no clear substrate preference (e.g. Parakiefferiella) or tended to be distinctly less abundant on certain substrata (e.g. Dicrotendipes - gravel and sand, Polypedilum simulans - silt, Marstonia decepta - sand).

Potamothrix moldaviensis, Slavina appendiculata, Gyraulus parvus, Pisidium spp. and Nanocladius spp. seemed to be indifferent to both depth and substraum. Of these, only Pisidium spp. and Nanocladius spp. occurred at high densities and since each included several species which could not be separated reliably, broad distributions are not surprising.

Ordination was used in an attempt to define communities of invertebrates which could be related to environmental factors such as lake, depth or type of substratum. Data matrices used in the computations consisted of $\log_{10}$ and percentage transformed counts of the 50 most common taxa, groups of taxa (e.g. Tubificidae, Gastropoda, Chironomini, etc.) or combinations of groups and individual taxa. Both Principal Components Analysis (PCA) and Reciprocal Averaging (RA) techniques were applied; PCA consistently gave superior results in terms of the amount of variance 'explained'. Ordinations based on percentage composition reflected the relative dominance of a few groups, especially Nematoda, Tanytarsini and Gastropoda, but showed no relationship to any obvious environmental factor. Of the ordinations performed, the best results were obtained using PCA and log-transformed counts of selected taxa and groups, with the results shown in Figs. 5 & 6. The first three principal component axes account for 30, 15 and 10% of the variation in the data matrix, not a very strong ordination. Tanytarsini, P. hoyi, other Amphipoda, Nematoda, V. intermedia, S. herringianus and Chironomini were the most unique elements of the fauna (Fig. 5). Axis 1 scores in the ordination of samples (Fig. 6) mainly reflect total abundance, Axis 2 separates most stations with rock substrata from all others and Axis 3 is weakly related to depth.

It is difficult to define distinct communities from such a weak ordination; few stations had unique combinations of taxa. The most obvious group consists of stations with silty substrata at depths of 10 and 20m in North Channel (#1 in Fig. 6) characterized by P. hoyi, M. speciosa and a variety of oligochaetes, all at low densities (total standing stocks: 450-6000 individuals m^{-2}). The deepwater communities on sand and gravel in Lake Huron and open Georgian Bay (#2 in Fig. 6) were dominated by Nematoda and immature Tubificidae. These areas are more subject to wind-generated water movements as indicated by their coarser sediments. Most stations in group #3 were shallow with rocky substrata, while the remaining stations were very heterogenous including all depths and types of

substratum. These stations differed mainly in the relative and absolute abundance of Tanytarsini (especially Cladotanytarsus), Chironomini (especially Pseudochironomus), snails and amphipods. Ablabesmyia and Pseudosmittia - gp. were characteristic of most stations in group 3.

DISCUSSION

Previous assessments of the trophic status of Lake Huron, Georgian Bay and North Channel have been that the former is in the early stages of mesotrophy (Shrivistava 1974), Georgian Bay is oligotrophic (Patalas 1972) and North Channel may be somewhat enriched by organic detritus entering via the St. Mary's River (Loveridge and Cook 1976). Shrivistava's (1974) conclusions were based on apparent decreases in the abundance of the amphipod, P. hoyi, and increases in the abundance of oligochaetes between 1960 and 1971. As pointed out by Cook and Johnson (1974), these changes may actually have resulted from differences in the season and pattern of sample collection. The results of earlier surveys of the nearshore waters (0-25m) of Lake Huron and those of the present survey are summarized in Table 4. The only group collected in similar numbers in all studies has been the Sphaeriidae, perhaps because these are relatively large and immobile so are more reliably collected and retained by the grabs and coarse seives (500-600µm) used in the earlier studies. The different proportions of other groups and larger total standing stocks seem to reflect the more efficient techniques used in 1980. Especially significant is the fact that all types of substrata were sampled while earlier surveys were limited to sediments which could be collected by grabs, generally sands and silts.

The importance of the techniques used to collect samples is further emphasized by comparison of the samples collected by Loveridge and Cook (1976) at depths of 10-21m in Georgian Bay with those from the same range of depths in the present survey (Table 5). Since they used a finer mesh (100µm) to concentrate their samples, Loveridge and Cook undoubtedly lost fewer animals during the seiving process. The large proportion of nematodes in their samples is good evidence of this. Since there have been no changes in Georgian Bay since 1974 which could logically account for a 500% increase in total standing stocks, I conclude that the diver-operated core and airlift are much more efficient in sampling benthic invertebrates than is the Ponar grab (see also Flannagan 1970).

The mean total benthic standing stock at depths of 10-21m reported from North Channel by Loveridge and Cook (1976) is identical to that found in the present survey (Table 5). There are, however, differences in the relative contribution by various groups, especially Sphaeriidaie, P. hoyi and Chironomidae. I interpret this to mean that nematodes have been underestimated because of the coarser mesh sieves used in 1980, and the different proportions of the other groups are mainly a result of the greater range of types of substrata sampled by the divers.

Barton and Carter (1979) sampled the benthic fauna of Owen Sound near Transects 15A-C and off Wasaga Beach near Transect G6. Samples taken in August 1978, in Owen Sound with a Shipek Grab were, in most cases, qualitatively similar to those taken in 1980, but the latter samples gave standing stock estimates which were 2-5 times larger. The quantitative differences were not so great off Wasaga Beach, but this is probably because Transect G6 was not in the area enriched by organic detritus from the Nottawasaga River which was sampled in 1978. Barton and Carter (1979) found a zone of heavily enriched sediments with very large standing stocks, consisting mainly of Tubificidae, in Owen Sound south of Transect G15A. The zone of enrichment does not appear to have spread further into the bay. In fact, none of the stations sampled during 1980 showed evidence of significant organic enrichment or environmental degradation. Pollution tolerant organisms never dominated the fauna in any part of the study area.

Barton and Carter (1982) recently demonstrated that exposure to wave action is one of the most important environmental factors influencing the composition of epilithic invertebrate communities in eastern Georgian Bay. Evans and Stewart (1977) felt that frequency of disturbance of the sediments by waves had a major impact on the abundance of benthic animals at depths of 6 and 9m in Lake Michigan. On the basis of these observations, the ordination of the present series of samples was expected to show some relationship to degree of exposure.

That is, deep stations should be less exposed than shallow ones, west facing transects should be more exposed than east facing ones, etc. The results did not support this hypothesis except that shallow stations with rock substrata were generally grouped separately from those on other substrata. Since this survey was not specifically designed to investigate the role of wave action as a determinant of benthic community structure, this result is not too surprising. Barton and Carter (1982) found that there were substantial seasonal changes in their index of exposure on any given transect, and the present survey took nearly a month to complete. Autumn is also the time when most insects are present as early instars which are still in the process of dispersing to preferred habitats after hatching in very shallow water (see review by Barton 1981).

There are at least two other possible reasons for the failure to define distinctive communities in the study area and the environmental factors which control them: 1) at depths of 5.20m the direct action of surface waves may be subordinant to less easily quantifiable factors such as currents and internal waves, and 2) the fauna of the nearshore zone is extremely diverse, but has relatively few dominant species, and these have broad tolerances for depth and substrate. The sample size used in this survey may have been too small to accurately estimate differences in the abundance of subdominant, but distinctive, species.

The effects of currents and internal waves on benthic communites in lakes are poorly understood, but have been reported on a local scale by several investigators. Wind driven currents and the Coriolis effect seem to be important factors in the distribution of benthic animals in certain bays such as Saginaw Bay (Schneider et al. 1969) and Owen Sound (Barton and Carter 1979). Brinkhurst (1974) and others have suggested thermal stress associated with internal seiches as the cause of the 'sublittoral minimum' in the abundance and

variety of benthic animals. Emery (1970) reported direct observations of mortality of benthic fish and crayfish due to an internal seiche in Georgian Bay. The consistently low standing stocks observed at 20m in North Channel may represent a 'sublittoral minimum', especially in view of the relatively higher standing stocks in deeper water reported by Loveridge and Cook (1976).

Choice of an appropriate sample size is always a problem in designing benthic surveys (Elliott 1977, Green 1979). The final decision is usually a compromise between statistical adequacy and the resources available for processing the samples. The 3 replicate samples of 78.5cm used in the present survey appeared to be adequate to estimate the standing stock of the dominant species on most substrata, but more effort appears to be needed to assess less abundant species on heterogeneous substrata such as gravel and rock. This problem is by no means unique to this study; the variances of species counts at individual stations were similar to those reported from other benthic surveys (Downing 1979). The most appropriate number and size of samples from various substrata in the Great Lakes will probably have to be determined empirically.

Despite these limitations, the results of this survey indicate that the nearshore zone of Lake Huron, Georgian Bay and North Channel is a complex environment which supports a very diverse benthic fauna. The depth zone of 5.20m is the area of transition from the shallow wave-zone characterized by a basically rheophilic community (Barton and Hynes 1978) to the deep, offshore zone dominated by P. hoyi, oligochaetes and sphaeriids. This is not a sharp break, the depth ranges of various characteristic species, such as Pseudochironomus, Pseudosmittia and P. hoyi, seem to vary with local conditions. The broad substrate tolerances observed for most taxa may be highly adaptive in such a dynamic environment.

Finally, special mention should be made of the occurence of Ripistes parasitica on Transect A in North Channel. This species was included in a recent key to the Naididae of North America by Hiltunen and Klemm (1980) since it was suspected to be present, but could not be confirmed (J.K. Hiltunen, pers. comm.). It is widely distributed in Europe and Russia where it typically occurs in association with rooted vegetation (Popchenko 1980, Juget 1980). The specimens from North Channel were found at a depth of 10m on a bottom of rock with pockets of sand and gravel up to 10cm thick. No macrophytic vegetation was apparent. A total of 13 specimens were found which gives an estimated abundance of 552 m^{-} . I have also seen this species in samples from similar habitat in Thunder Bay, Lake Superior. This distribution suggests that the species has reached the Great Lakes via ships engaged in international trade.

LITERATURE CITED

Barton, D.R. 1981. Effects of hydrodynamics on the distribution of lake benthos, in: M.A. Lock and D.D. Williams (eds.). Perspectives in Running Water Ecology. Plenum, N.Y. pp. 251-263.

_____ and H.B.N. Hynes, 1978. Wave-zone macrobenthos of the exposed Canadian shores of the St. Lawrence Great Lakes, J. Great Lakes Res. 4:27-45.

_____ and J.C.H. Carter, 1979. Benthic macroinvertebrates from southern Georgian Bay. Waterloo Res. Inst. Report No. 01SU.KF 714-8-0045, 53 pp.

_____ and ____, 1982. Shallow-water epilithic invertebrate communities of eastern Georgian Bay, Ontario, in relation to exposure to wave action. Can. J. Zool. 60: in press.

Bio-Environmental Services, Ltd. 1981. Lake Huron and Georgian Bay nearhsore sediment and benthic survey-1980. ms. report to Ministry of the Environment, Toronto.

Brinkhurst, R.O. 1974. The Benthos of Lakes. MacMillan, London. 190 pp.

Cook, D.G., and M.G. Johnson, 1974. Benthic macroinvertebrates of the St. Lawrence Great Lakes. J. Fish. Res. Bd. Canada 31:763-782.

Downing, J.A. 1979. Aggregation, transformation and the design of benthos sampling programs. J. Fish. Res. Bd. Canada 36:1454-1463.

Elliott, J.M. 1977. Some methods for the statistical analysis of samples of benthic invertebrates. Freshwater Biol. Assn., Sci. Publ. 25:160 pp.

Emery, A.R. 1970. Fish and crayfish mortalities due to an internal seiche in Georgian Bay, Lake Huron, J. Fish. Res. Bd. Canada 27:1165-1168.

Evans, M.S. and J.A. Stewart 1977. Epibenthic and benthic microcrustaceans (copepods, cladocerans, ostracods) from a nearshore area in southeastern Lake Michigan, Linmol. Oceanogr. 22:1059-1066.

Flannagan, J.F. 1970. Efficiencies of various grabs and corers in sampling freshwater benthos. J. Fish. Res. Bd. Canada 27:1691-1700.

Gauch, H.G.,Jr. 1977. ORDIFLEX: a flexible computer program for four ordination techniques: weighted averages, polar ordination, principal components analysis, and reciprocal averaging. Ecology and Systematics, Cornell Univ., Ithaca, N.Y. 185 pp.

Green, R.H. 1979. Sampling Design and Statistical Methods for Environmental Biologists. John Wiley & Sons, N.Y. 257pp.

Hultunen, J.K. and D.J. Klemm, 1980. A guide to the Naididae (Annelida: Clitellata:Oligochaeta) of North America. Env. Monit. Rep., U.S. Env. Prot. Ag. EPA-600/4-80-031, 48 pp.

Juget, J. 1980. Aquatic Oligochaeta of the Rhone-Alpes area: current research priorities. in: R.O. Brinkhurst and D.G. Cook (eds.). Aquatic Oligochaete Biology, Plenum, N.Y., pp. 241-251.

Laidlaw, S.A. 1980. Georgian Bay, North Channel sediment and benthic survey. ms. report to Ministry of Environment, Toronto.

Loveridge, C.C., and D.G. Cook. 1975. A preliminary report on the benthic macroinvertebrates of Georgian Bay and North Channel. Env. Canada, Fish. Mar. Service, Res. Div. Tech. Rep. 610:46 pp.

Patalas, K. 1972. Crustacean plankton and the eutrophication of St. Lawrence Great Lakes. J. Fish. Res. Bd. Canada 29: 1451-1462.

Popchenko, V.I. 1980. Oligochaete fauna of the lakes of the Solovets Archipelago, in: Aquatic Oligochaete Worms - Taxonomy, Ecology and Faunistic Studies in the USSR. Akademiya Nauk SSSR. (English translation, U.S. Dept. of Inter. and Nat. Sci. Found., Amerind Publ. Co. Pvt. Ltd., New Delhi). pp. 45-54.

Schneider, J.C., F.F. Hooper and A.M. Beeton, 1969. The distribution and abundance of benthic fauna in Saginaw Bay, Lake Huron. Proc. 12th Conf. Gt. Lakes Res.:80-90.

Shrivastava, H. 1974. Macrobenthos of Lake Huron. Fish. Res. Bd. Canada, Tech. Rep. No. 449:45 pp.

Teter, H.E. 1960. The bottom fauna of Lake Huron. Trans. Am. Fish. Soc. 89:193-197.

Table 1. Principal substrata at sampling stations in the nearshore of Lake Huron (H), Georgian Bay (G) and North Channel (N). R = rock, G = gravel, C = clay, S = sand, Si = silt.

Station	Depth (m) 5	10	20
H1	S	G	S
H2	R	G	G
H3	R	R	G
H4	R	R	R
H17	R	R	S
G2	R	G	G
G4	R	R	S/Si
G5	R	Si/R	C
G6	G	G	S/Si
G7	S	S	Si
G14A	Si/S S/Si	Si/s	
G14B	S/Si	Si/S	Si
G14C	G	G	
G15A	S/Si S	S/Si	
G15B	R	R	Si/S
G15C	R	Si/R	
G26	R	R	R/Si
G27	R/Si	R/Si	R/Si
N11	R	R	R
N12	R	R	S
N13	R	R	S
N14	Si	Si	Si
N15	Si	Si	Si
N16	S	Si/S	Si
N17	R	R	S
N18	C	C R	Si
NA		Si/S	S
B		Si	

Station	Depth(m) 1.5	1.0	2.0	1.0	2.0
G16 1-5	G	R	G	G	S

Table 2. Mean total standing stocks of invertebrates (95% confidence limits, individuals m^{-2}) on different substrata.

Substrate \ Depth (m)	5	10	20
Rock	4622-7513	6030-9705	2277-4098
Gravel	8851-22692	11732-20106	13082-24480
Clay	18213-38531	11905-31177	4643-13361
Sand	3382-6453	9884-12153	2882-7032
Silt/Sand	6291-10594	3281-5168	7672-16255
Silt	10496-16858	2815-5664	1958-4062

Table 3. Mean number of taxa per sample (95% confidence limits) on different substrata.

Substrate \ Depth (m)	5	10	20
Rock	16.6-22.0	18.6-22.3	10.9-13.7
Gravel	20.0-24.4	23.2-27.5	17.4-22.6
Clay	34.3-45.0	29.6-41.7	8.6-11.4
Sand	10.1-12.6	11.7-14.2	8.4-12.6
Silt/Sand	14.6-18.6	9.2-12.9	13.3-19.2
Silt	22.0-27.6	10.5-18.7	7.9-11.6

Table 4. Mean standing stocks and percentage composition of benthic invertebrates reported from the nearshore zone of Lake Huron. ND = no data

Source	Teter (1960)	Schuytema Powers (1966)	Shrivastava (1974)	This study
Depth (m)	5.5-25.0	0-20	9-25	5-20
Total Benthos ($\#m^{-2}$)	625	1273	700	14731
% Nematoda	0.6	3.1	ND	20.1
Oligochaeta	6.6	64.4	38.5	26.4
Gastropoda	ND	1.6	12.8	5.2
Sphaeriidae	10.4	7.0	28.6	1.2
Amphipoda	53.4	3.9	12.4	6.6
Chironomidae	16.0	18.1	7.8	31.0
Other insects	ND	1.1	ND	2.0

Table 5. Mean total standing stocks and percentage composition of benthic invertebrates reported from depths of 10-21m in Georgian Bay and North Channel. (Stations in Owen Sound and Colpoys Bay have been ommited.)

Source	Loveridge & Cook 1976		This study	
	Geo. Bay	No. Channel	Geo. Bay	No-Channel
Total Benthos ($\#m^{-2}$)	2972	5113	15782	5260
% Nematoda	50.1	29.0	34.2	14.8
Oligochaeta	27.3	20.2	19.2	21.1
Sphaeriidae	2.0	17.5	1.7	3.4
P. hoyi	1.3	19.5	0.7	3.6
Chironomidae	8.5	7.1	37.2	38.1
Other insects	0.5	0.5	1.0	5.2

FIGURE 1. Nearshore transects sampled in Lake Huron (H) and North Channel (N).

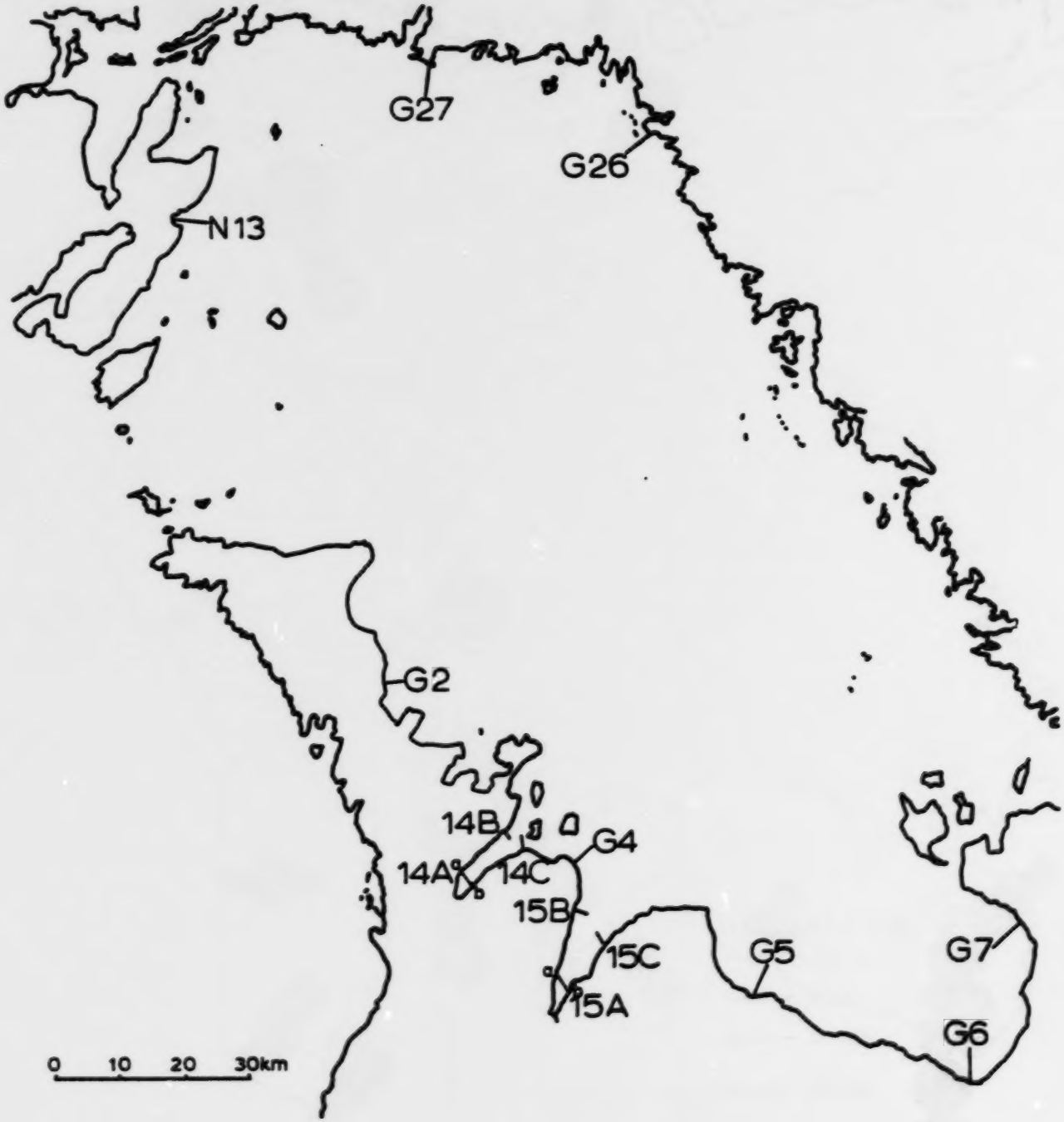

FIGURE 2. Nearshore transects sampled in Georgian Bay.

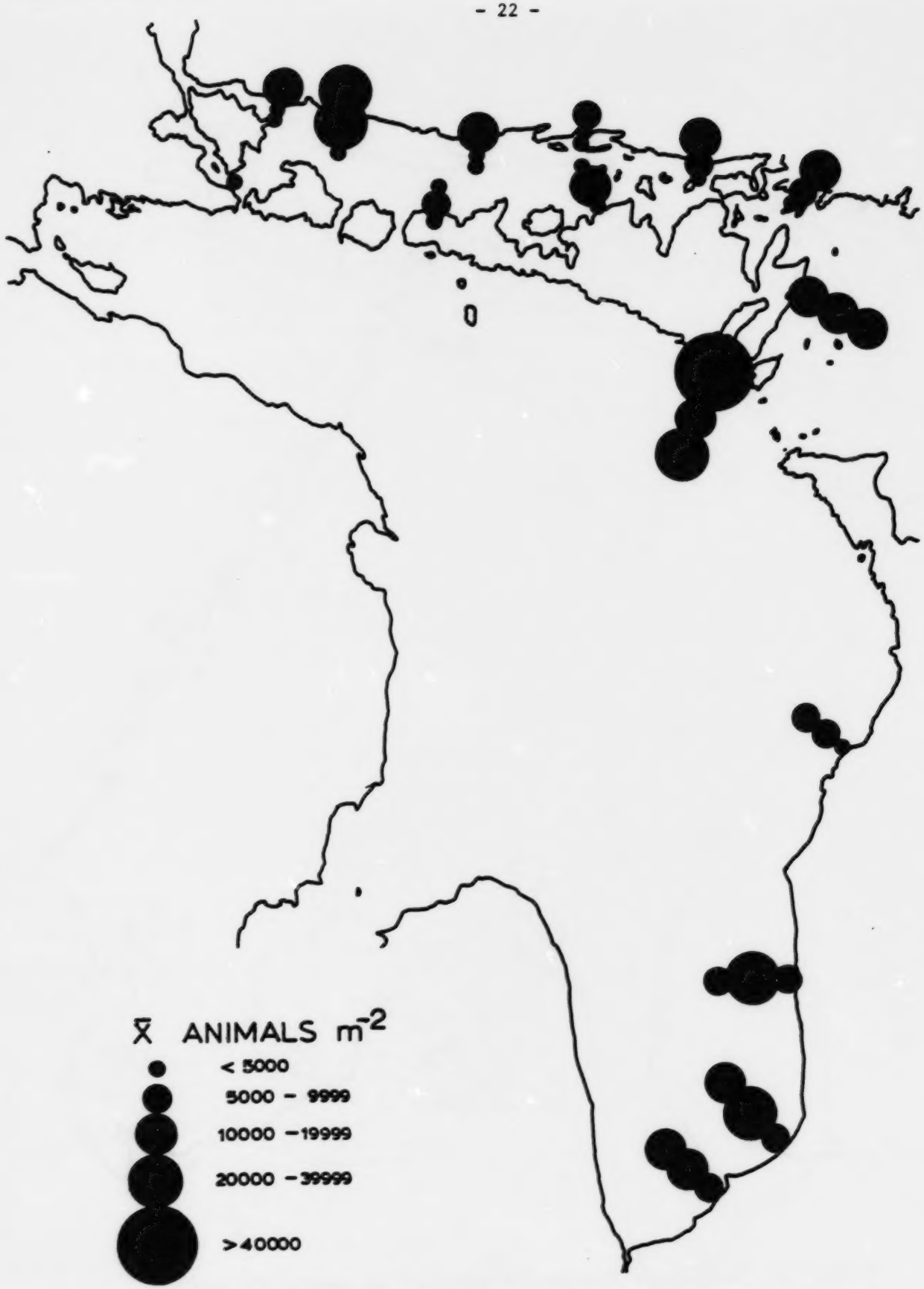

FIGURE 3. Approximate mean standing stocks of invertebrates at depths of 5, 10 and 20m in Lake Huron and North Channel.

FIGURE 4. Approximate mean standing stocks of invertebrates at depths of 5, 10 and 20m in Georgian Bay. Open circles indicate that no samples were collected.

FIGURE 4a. Details of Transect G16 (stations 1 - 5) on Mary Ward Shoals, Georgian Bay. Scale of mean standing stocks of invertebrates as in Fig. 3.

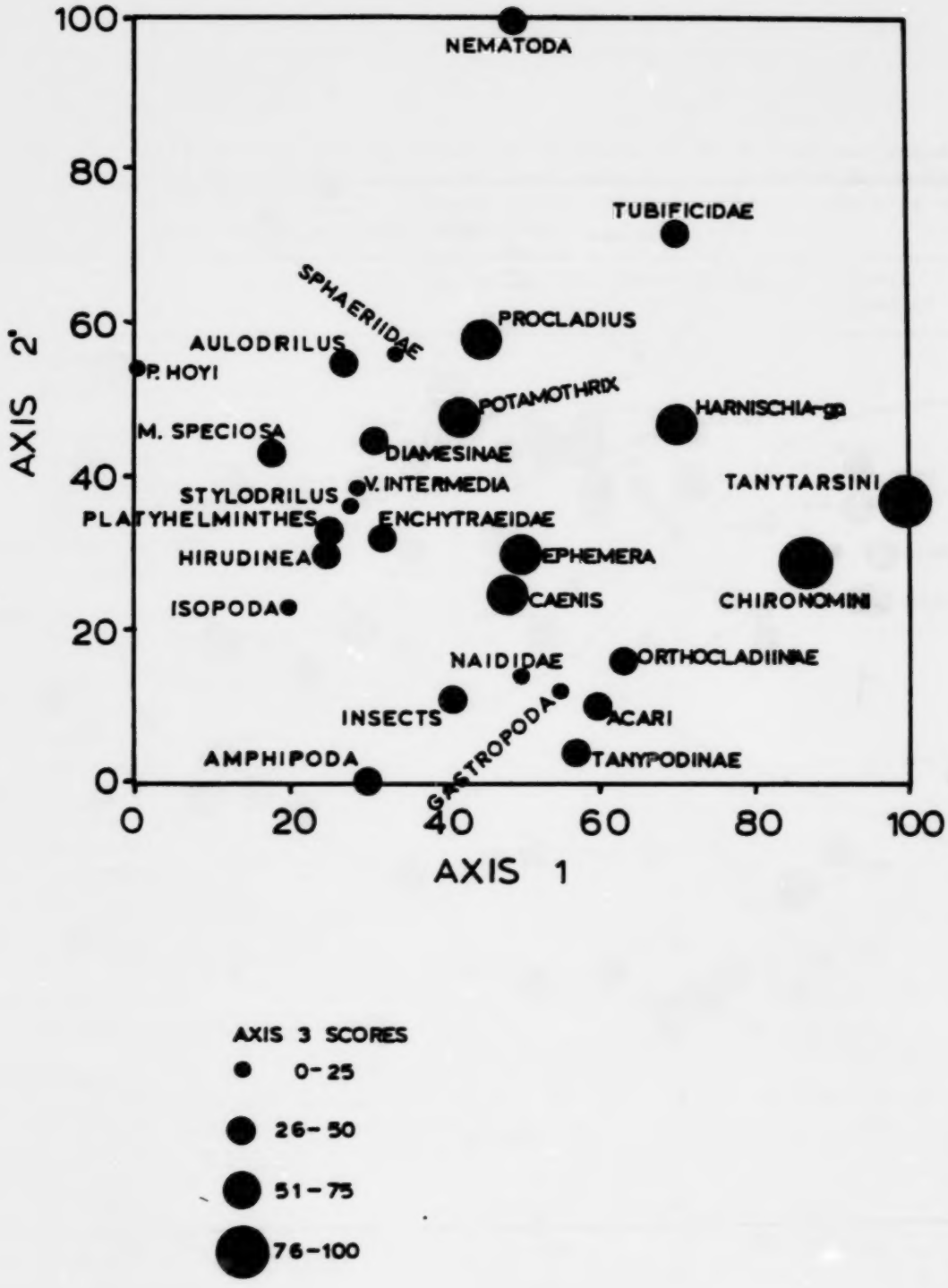

FIGURE 5. Principal Components Analysis ordination of invertebrate groups and individual taxa from all nearshore stations. See text for details.

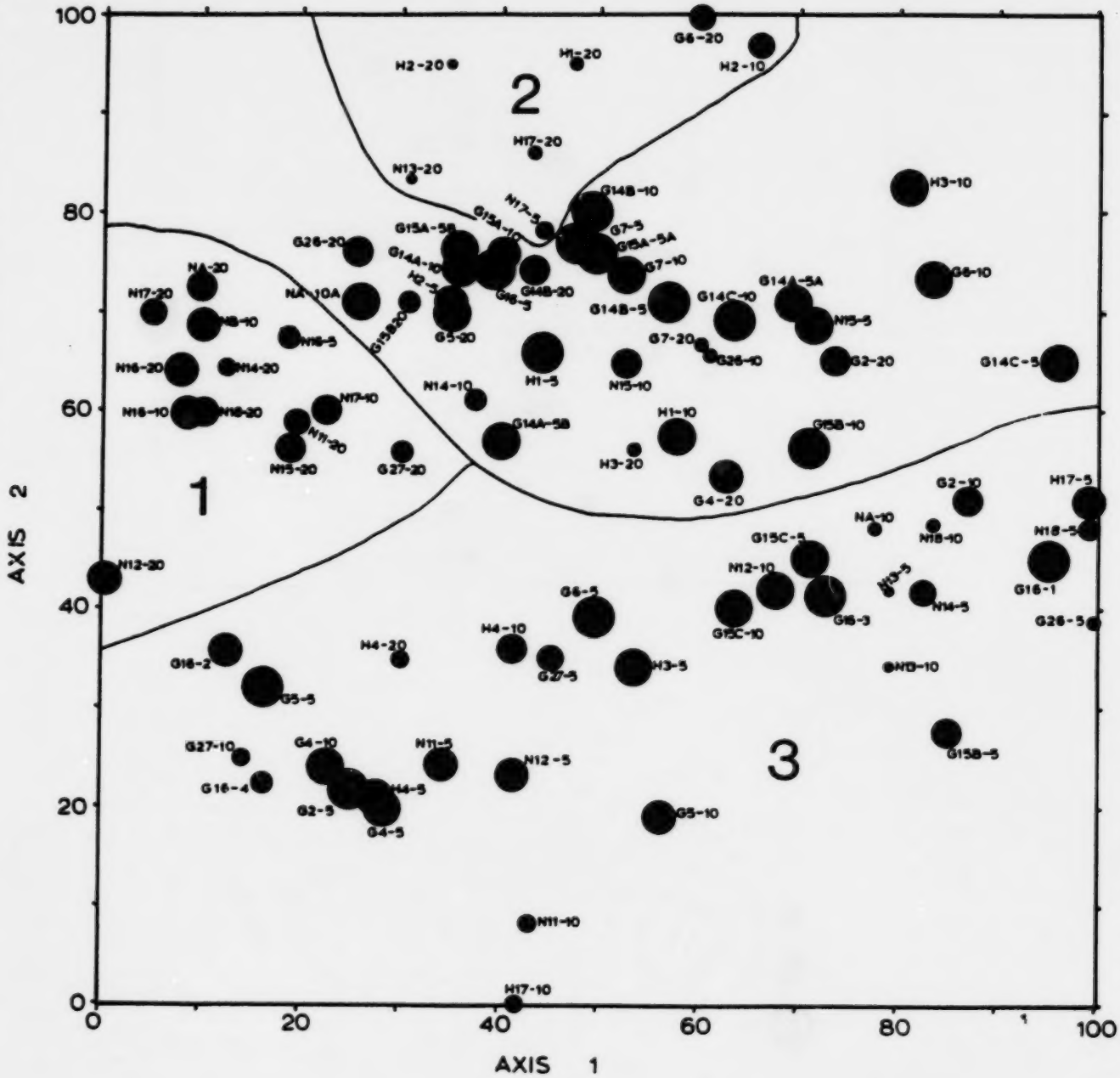

FIGURE 6. PCA ordination of nearshore stations. Size of symbols corresponds to score on axis 3. See text for details.

Appendix A. List of taxa and the number of stations at which each was found. Maximum number of stations: Lake Huron = 15, Georgian Bay = 42, North Channel = 28. Values in parentheses indicate immatures which could not be assigned to species.

	Huron	Georgian Bay	North Channel
Coelenterata			
Hydra	0	4	2
Platyhelminthes			
Rhabdocoela	7	1	0
Hydrolimax grisea	1	7	7
Dugesia tigrina	2	4	1
Phagocota sp.	0	0	3
Procotyla fluviatilis	0	1	0
Nemertea			
Prostoma canadiensis	0	4	1
Nematoda	15	36	26
Polychaeta			
Manayunkia speciosa	0	6	10
Oligochaeta			
Aelosomatidae			
Aelosoma sp.	0	4	1
Lumbriculidae			
Lumbriculus variegatus	1	1	2
Stylodrilus herrignianus	9	16	15
Sparganophilidae			
Sparganophilus eiseni	1	1	1
Tubificidae			
immatures with hair setae	10	29	15
immatures without hair setae	12	37	23
Aulodrilus americanus	2	9	7
A. limnobius	4	7	4
A. piqueti	5	6	3
A. pluriseta	2	5	3
Limnodrilus hoffmeisteri	1	2	1
L. newaensis	1	2	0
L. profundicola	0	1	0
Peloscolex curvisetosus	2	1	0
P. ferox	6	10	15
P. freyi	1	1	1
Potamothrix moldaviensis	5	7	3
P. vejdovskyi	11	16	8

	Huron	Georgian Bay	North Channel
Rhyacodrilus sp.	1		1
Tubifex ignotus	2	3	1
T. kessleri americanus	1		1
Enchytraeidae	6	18	13
Naididae			
Amphichaeta sp.	3	1	0
Arcteonais lomondi	2	1	5
Chaetogaster cristallinus	1	2	0
C. diaphanous	2	3	2
C. diastrophus	0	0	3
Nais bretscheri	0	2	0
N. communis	0	6	5
N. elinquis	0	1	0
N. pardalis	0	1	0
N. simplex	3	4	1
N. variabilis	6	12	4
Ophidonais serpentina	0	2	0
Piquetiella michiganensis	7	17	8
Pristina foreli	4	5	9
P. idrensis	1	0	2
P. longiseta	0	4	0
P. osborni	0	1	0
Ripistes parasitica	0	0	1
Slavina appendiculata	4	10	10
Specaria josinae	2	5	5
Stylaria fossularis	0	1	2
S. lacustris	5	8	5
Uncinais uncinata	5	1	6
Vejdovskyella comata	0	0	1
V. intermedia	10	11	9
Hirudinea			
Erpobdella punctata	1	0	0
Helobdella fusca	0	0	1
H. stagnalis	2	4	2
Nephelopsis obscura	0	1	0
Placobdella montifera	1	0	0
Gastropoda			
Amnicola limosa	2	2	1
Bithinia tentaculata	1	0	0
Ferrissia sp.	0	3	0
Goniobasis livescens	0	2	1
Gyraulus parvus	8	12	10
Helisoma trivolis	0	1	1

	Huron	Georgian Bay	North Channel
Lymnaea sp.	4	3	6
Marstonia decepta	7	26	12
Physa sp.	3	6	4
Pleurocera acuta	1	1	0
Promenetus exacuous	0	2	2
Valvata lewisii	2	3	3
V. sincera	5	8	15
V. tricarinata	4	2	11
Pelycepoda			
Musculium partumeium	1	0	0
M. transversum	0	0	1
Pisidium spp. (all)	6	16	20
P. casertanum	2	0	0
P. compressum	0	4	0
P. conventus	0	1	0
P. insigne	2	8	3
P. milium	0	1	0
P. nitidum	1	3	0
P. subtruncatum	0	2	0
P. variabile	1	0	0
P. ventricosum	2	2	1
Sphaerium spp (all)	3	8	3
S. rhomboideum	0	1	0
S. simile	0	1	0
Anodonta sp.	0	1	0
Lampsilis radiata	0	0	2
Acari	3	4	0
Hydracarina	12	26	16
Amphipoda			
Crangonyx gracilis	0	4	6
Gammarus fasciatus	0	1	2
G. lacustris	0	1	0
G. pseudolimnaeus	1	7	0
Hyalella azteca	7	20	10
Pontoporeia hoyi	6	3	9
Isopoda			
Asellus forbesi	0	0	6
A. intermedius	1	7	0
A. racovitzai	1	1	3
Lirceus sp.	1	4	4
Decapoda			
Orconectes propinquus	1	2	0

	Huron	Georgian Bay	North Channel
Insecta-Ephemeroptera			
Baetis sp.	0	2	0
Paraleptophlebia sp.	1	6	4
Heptagenia sp.	1	0	1
Stenacron interpunctatum	0	2	0
Stenonema tripunctatum	2	7	1
Caenis sp.	3	14	8
Ephemerella bicolor	0	4	1
Ephemera simulans	4	18	8
Hexagenia atrocaudata	0	0	2(7)
H. limbata	0	0	2
Odonata			
Gomphus lividus	0	0	1
Plecoptera			
Hastaperla brevis	0	1	1
Isoperla sp.	0	0	1
Leuctra sp.	0	1	0
Paracapnia sp.	0	2	0
Hemiptera			
Sigara lineata	0	0	1
Neuroptera			
Sialis sp.	0	0	4
Trichoptera			
Ceraclea sp.	1	1	1
C. flava	0	1	0
Mystacides sp.	1	0	0
M. longicornis	0	0	2
Oecetis sp.	4	3	7
O. inconspicua	1	0	0
Hydroptilidae	1	0	3
Cheumatopsyche sp.	1	1	0
Molanna sp.	0	0	1
Phylocentropus sp.	0	0	1
Polycentropus sp.	1	5	3
Ptilostomis sp.	0	0	1
Lepidosoma sp.	2	1	1
Coleoptera			
Dubriaphia sp.	1	0	0
Stenelmis sp.	0	1	0

	Huron	Georgian Bay	North Channel
Diptera - Ceratopogonidae	1	3	7
Chaoboridae	0	0	3
Empididae	0	4	1
Chironomidae			
Ablabesmyia	6	19	6
Clinotanypus	0	0	3
Conchapelopia	0	1	0
Labrundinia	0	0	2
Larsia	2	3	7
Nilotanypus	1	0	2
Procladius	11	29	12
Thienemanninyia - group	7	13	5
Monodiamesa depectinata	0	1(13)	4
M. tuberculata	6	2	0
Pagastia	1	1	0
Potthastia longimanus - group	5	9	6
Protanypus cf. ramosus	0	1	3
Syndiamesa	0	0	1
Chironomus	4	0	0
C. anthracinus - group	0	5	0
C. fluviatilis - group	4	5	1
C. salinarius - group	0	2	0
Cladopelma	0	3	1
Cryptochironomus	8	31	16
Cryptotendipes	2	11	5
Demicryptochironomus	5	2	0
Dicrotendipes fumidus	7	14	6(12)
D. modestus	0	1	0
D. neomodestus	0	0	5
Endochironomus	2	2	7
Harnischia	0	1	1
Microtendipes cf. caducus	3	17	7
M. cf. pedellus	6	7	0
Nilothauma	1	2	0
Pagastiella	0	0	1
Parachironomus	0	5	4
Paracladopelma	0	11	7
P. rollei	0	1	0
P. undine	0	0	1
P. winnelli	5	0	0
Paralauterbourniella	1	3	1
Paratendipes	1	8	1
Phaenopsectra	2	10	1
P. flavipes	1	1	0
Polypedilum laetum	1	1	0
P. scalaenum	5	17(2)	8(10)

	Huron	Georgian Bay	North Channel
P. simulans	5	14	1
P. nr. tritum	0	2	0
Pseudochironomus cf. articaudatus	(9)	1(19)	(6)
P. cf. fulviventris		1	
Robackia demeijerei	0	0	1
Stictochironomus	7	16	6
Tribelos	0	1	0
Cladotanytarsus	14	38	15
Micropsectra	2	7	1
Paratanytarsus	1	3	3
Rheotanytarsus	0	2	1
Stempellina	2	7	6
Tanytarsus	7	36	21
Zavrelia	2	9	5
Corynoneura	5	3	3
Cricotopus	2	7	5
C. bicinctus	0	2	0
C. tremulus - group	0	1	0
C. trifascia - group	0	1	0
C. Isocladius	0	0	2
Epoicocladius	0	2	0
Heterotrissocladius changi	0	1(18)	1(11)
H. hirtapex	10	2	1
H. latilaminus	0	0	2
Krenosmittia	0	1	2
Nanocladius	6	12	10
N. cf. balticus	0	4	0
Orthocladius	0	2	1
Paracladius	1	6	2
Parakiefferiella sp. 1	(11)	18(2)	15
P. sp. 2		12	
P. triquetra	0	1	0
Psectrocladius	3	2	2
Pseudosmittia - group	4	12	4
Synorthocladius	1	4	0
Thienemanniella	1	2	1

Appendix B. Complete results of benthic invertebrate sampling. ( ) indicate early instars or damaged specimens not identified to species.

	5 m			10m			20m		
Transect H1	1	2	3	1	2	3	1	2	3
Rhabdocoela		1	1		1				
Nematoda	23	13	25	10	23	11	42	28	167
H. stagnalis				1	1	1			
Enchytraeidae				1		1			1
L. variegatus							2	1	6
S. herringianus							4		4
Amphichaeta		1			1				
A. lomondi							2		1
C. diaphanous				2	1	1			
N. variabilis				1	1				
N. simplex						2			
P. michiganensis				3	1	2			
P. foreli				1	1		1		
P. idrensis								1	1
S. josinae						1			
U. uncinata					3				
V. intermedia					3				3
A. limnobius								2	
A. piqueti	3	2	5						
L. newaensis									1
P. ferox							12	4	8
P. vejdovskyi		1	1	1		1			5
P. curvisetosus							2	2	1
Rhyacodrilus							1		1
imm.Tubif. w/hr. setae			1					1	2
" " w/o "		1	5	2	4	3	13	9	8
A. limosa	1								
V. tricarinata							1		
M. partumieum					1				
P. insigne							8	1	6
Acari			1						
Hydracarina	1	1	1		2				
P. hoyi							19	5	16
A. racovitzai							4		1
E. simulans	1			1		1			
Caenis		3							
O. inconspicua			2						
Polycentropus								1	
Ablabesmyia				3					
Procladius	1		1	4	6	2	3	2	
Thienemannimyia - gp.					1	2			
Monodiamesa			1						1
P. longimanus - gp.									1
Chironomus	1						3		
Cryptochironomus	4		5	4	2	3			

Appendix B. Complete results of benthic invertebrate sampling. ( ) indicate early instars or damaged specimens not identified to species.

	5 m			10m			20m		
Transect H1	1	2	3	1	2	3	1	2	3
Cryptotendipes								1	2
Demicryptochironomus		1		2					
M. caducus		1							
M. pedellus				5	4				
P. winnelli							3		1
Phaenopsectra		3	1	1					
P. laetum							8	3	7
P. scalaenum	3		6						
P. simulans	4	2	6						
P. articaudatus			7	1		5			
Stictochironomus				4	6	3			2
Cladotanytarsus	2		7	1	4	3		1	
Tanytarsus					3	1	7		1
Zavrelia				1					
Corynonoura		1			1				
Heterotrissocladius					8		1		1
Parakiefferiella	2		5	16	13	15	1		
Psectrocladius	1								

Transect H2	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Rhabdocoela			1	2					
Nematoda	4	14	30	93	32	20	39	30	70
S. eiseni			1						
S. herringianus				4		4	8	7	9
N. variabilis			1		3	2			
P. michiganensis	13	10	8	5	1	6		1	
U. uncinata				1					
V. intermedia					3		7	6	7
A. americanus				3		1			
A. limnobius				17					
A. piqueti		1		13	3	9			
A. pluriseta				5	1	6			
L. hoffmeisteri							1		
P. ferox			2	10	5	6			
P. moldaviensis		1		12		7	3		2
P. vejdovskyi	1	1		12	6	9	4	3	5
P. curvisetosus									1
imm.Tubif. w/o hr. setae	28	20	20	91	47	62	15	8	16
" " w/ "			1	2	1		1	1	1
G. parvus								1	
M. decepta				1		1			
V. sincera									2
V. tricarinata							1		1
P. casertanum				1			24	2	
P. insigne									2
P. nitidium			1						
P. variabile						2			
P. ventricosum					1		1		
Sphaerium				9		3			5
Hydracarina		1			1				
P. hoyi			1	1			14	17	25
Procladius				14	4	1	2	1	1
Thienemannimyia - gp.				2					
Monodiamesa				1			1		5
Chironomus sp.									1
C. fluviatilis - gp.	2	1						1	
Cryptochironomus	1		2	3		2			
Cryptotendipes				3		1			
Demicryptochironomus					2				
D. fumidus				1					
M. caducus					1				
M. pedellus	1								
Paracladopelma								1	
P. scalaenum				3					
P. simulans	1	2	7		2				

Transect H2	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
P. articaudatus			1		2				
Stictochironomus								1	
Cladotanytarsus		1	3	31	6	6			
Micropsectra				2					
Tanytarsus				5	2	1			
Heterotrissocladius				2					
Nanocladius							3	1	
Pakafiefferiella			1						1

Transect H3	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Rhabdocoela				1		9	1	2	
D. tigrina	1								
Nematoda	15			46	22	63	4	1	24
P. montifera			1						
Enchytraeidae							3		1
S. herringianus	2				1		17	11	5
A. lomondi									3
N. variabilis			1			3			
P. michiganensis	3								3
S. appendiculata								1	
S. lacustris				1		2	1	4	
U. uncinata						3		2	1
V. intermedia						3		5	9
A. limnobius				30	5	18			2
A. piqueti	1			22		6			
A. pluriseta				12		6			
P. freyi	1								
P. moldaviensis				16	2	12			1
P. vejdovskyi	1			32	1	24		2	1
imm. Tubif. w/o hr. setae	1			80	21	35		6	11
" " w/hr. "					1	15	2	1	1
B. tentaculata		1							
G. parvus	10	1						1	
M. decepta	4		1					2	
Physa							1	1	2
P. acuta	1								
Hydracarina	2		1	8	7	2		4	1
H. azteca								3	
P. hoyi									3
Caenis	5		2						
Heptagenia			1						
S. tripunctatum	1		1						
Cheumatopsyche	5								
Dubiraphia				1					
Ablabesmyia	14			5					
Procladius	1			19	5	2			1
Thienemannimyia - sp.	16	2		3	2	7	1		
P. longimanus sp.						1			2
C. fluviatilis - sp.				15			3	1	
Cryptochironomus	2			13	7	1			
Demicryptochironomus	1			3					
D. fumidus						5			
M. caducus	23	1	1						
M. pedellus	1			4					
Nilothauma	2								

Transect H3	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Pacladopelma	1								2
Paratendipes				2		15			
P. scalaenum				22	6				
P. simulans	1		1		10	15			
P. articaudatus	11		1	1	9				
Stictochironomus	4				1	1			2
Cladotanytarsus	10		2	24	11	57			4
Stempellina						2			
Tanytarsus				3			2	1	4
C. trifascia - gp	1								
Heterotrissocladius			1	1				1	6
Nanocladius						2			
Parakiefferiella	2			1	1	5	9	2	16
Synorthocladius	1								
Thienemanniella	1								

Transect H4	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Rhabdocoela									3
D. tigrina					1				
Nematoda		1		2	3	6	6	2	1
E. punctata					1	1			
Enchytraeidae							2	1	
S. herringianus				1	2	1			
C. diaphanous									2
N. variabilis								1	
N. simplex								1	
S. appendiculata							6	4	6
S. lacustris						1			5
V. intermedia				1	1		3	3	9
P. ferox								1	
P. vejdovskyi					3	1			
imm. Tubif. w/o hr. setae				4	5	3			
" " w/ " "						2			
G. parvus		1			1		5	1	9
Lymnaea		2					2	2	1
M. decepta							2	4	5
Physa					1				
V. lewisii								1	
V. sincera							1	1	1
V. tricarinata								1	2
Acari							1		
Hydracarina		1		8	2	4	2	4	10
G. pseudolimnaeus				1	1	1			
H. azteca	5			10	5	3		1	1
O. propinguus				1	1				
E. simulans						4			
Ceraclea		1							
Oecetis						1			
Hydroptilidae		1							
Ablabesmyia		22		6	1	4			
Procladius								1	
P. longimanus - gp.				1					
Chironomus								1	
Cryptochironomus						2			
D. fumidus		6	1		1	1			
M pedellus						2			
P. scalaenum				1	1				
P. articaudatus		5		2	3	3			
Cladotanytarsus		5				1	1	1	
Paratanytarsus		1							
Corynoneura						1			
C. trifascia - gp.			1						

Transect H4	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Heterotrissocladius				1				1	
Nanocladius		1							
Parakiefferiella						1			
Psectrocladius							1	1	
Pseudosmittia		12		2					

Transect H17	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
H. grisea	2	1							
Nematoda	55	5	5	3			96	55	134
H. stagnalis		1							
Enchytraeidae	3						4	6	18
S. herringianus	1	1	2				2		1
Amphichaeta								1	
C. cristalinus								3	
N. simplex				1		1			
P. michiganensis							5		7
P. forelI	1	1	1						3
S. appendiculata	1	1		3		5			
S. josinae		1	1						
S. lacustris				9		12			
U. uncinata							3		1
V. intermedia						2		2	4
A. americanus							1	1	2
P. ferox	6	4	5						1
P. vejdovskyi		1							
T. ignotus	13	28	16					2	
T. americanus		1	1						
imm.Tubif. w/o hr. setae	30	46	9				33	9	25
" " w/hr. setae	3	5	3				12	3	4
A. limosa	1								
G. parvus	6	2		2		8			
Lymnaea	2					1			
M. decepta	5		2	6		12		1	
Physa				1		1			
V. lewisii				2		1			
V. sincera	7		5		1	2			1
V. tricarinata				3		6			
Pisidium spp.	10	3	3				2		
Acari	4								
Hydracarina	16	1	1	2		1			
H. azteca	2	2		84		20			
P. hoyi							12		9
A. intermedius						3			
Lirceus				3		3			

Transect H17	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
E. simulans	2	2	1						
Caenis	7	3							
Stenonema				2		1			
Polycentropus				1		1			
Lepidosoma				1					
Bezzia	6	6	1						
Ablabesmyia				2					
Larsia	12	11	2	13		2			
Nilotanypus		3							
Procladius	22	9	7						1
Thienemannimyia - gp.				12		2			1
Monodiamesa	11		1				2		1
Pagastia				3		1			
P. longimanus - gp.	3	1	1						
Cryptochironomus	26	4	2						
P. fumidus	99	117	14	1					1
Endochironomus				2		1		1	
M. pedellus		6							
Paracladapelma									1
Paralauterbourniella	50	10	2						
P. flavipes			1						
P. scalaenum	2	2	1						
P. articaudatus				1					
Stictochironomus	2	2							
Cladotanytarsus	44	12	2	2					7
Micropsectra	4	2							
Stempellina	33		3						
Tanytarsus	52	12	3			1			
Zavrelia	8	2							
Corynoneura	1					1			
Heterotrissocladius	7	1	1				1	2	1
Nanocladius	2			1					1
Paracladius		1							
Parakiefferiella	10	2	1	1	1	1			
Psectrocladius				1					
Pseudosmittia	1		1	16		3			

Transect G2	5 m 1	2	3	10m 1	2	3	20m 1	2	3
H. grisea					1	3			
D. tigrina						1			
Nematoda				12	17	3	139	200	148
S. herringianus					1			6	4
imm.Tubif. w/hr. setae				1	3	1			
" " w/o "				21	4	14		2	
P. moldaviensis					3	1			
P. vejdovskyi				2	2	1			
T. ignotus				1					
Enchytraeidae				2	2	3		1	9
C. diaphanous			1						
N. simplex	2								
S. appendiculata				1					
S. josinae					1	1			
S. lacustris					1				
U. uncinata				1					
V. intermedia				3		2			
H. stagnalis					1				
G. parvus							3	3	2
M. decepta								2	10
Physa				1	1	1			
P. nitidium				2	1	1			
Sphaerium sp.				1	2				
Tardigrada								50	21
Hydracarina	1			3		2		1	3
C. gracilis	2					1			
H. azteca					1				
P. hoyi							1	3	2
Asellus sp.						1			
A. racovitzai								1	
Paraleptophlebia				1	2	5	1		
S. tripunctatum						5			
E. simulans				6	1	4	3	2	1
C. flava			1						
Empididae						1			
Ablabesmyia		2	3	10	2	9	3	4	3
Procladius				2		1	4	1	3
Thienemannimyia - gp	1	6		1	1				
Monodiamesa				1			1	1	
Pagastia	1	1							
P. longimanus - gp					1		3	3	3
Cryptochironomus				5	4	1	7	7	2
Cryptotendipes				1		1			
D. fumidus		3	4						

Transect G2	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
M. caducus				2		2			
M. pedellus							3	2	
Parachironomus						1			
P. undine				3			7	2	7
Paratendipes				11	8		2		
Phaenopsectra							1		
P. scalenum				9				5	3
P. simulans					5	3	5	8	3
Pseudochironomus	1	2	2						
Stictochironomus					6	1			
Cladotanytarsus			1	113	82	17	10	12	14
Micropsectra						2	1		
Rheotanytarsus	4	1							
Tanytarsus				5	2	2	12	4	16
Zavrelia				5	1	6	1		
Corynoneura						1	3	1	
Cricotopus				1	1	1		1	4
C. bicinctus			1						
Heterotrissocladius				7	1	3	19	16	17
H. changi							1		
nanocladius				6	5	1	24	18	19
Parakiefferiella sp.1			1	11	7		18	28	33
P. sp.2				9	4	6	10	9	22
Pseudosmittia - gp	2	4	7				1		1

Transect G4	5 m 1	5 m 2	5 m 3	10m 1	10m 2	10m 3	20m 1	20m 2	20m 3
H. grisea		1							
Nematoda							17	11	12
S. herringianus	2			1			6	1	1
imm. Tubif. w/hr. setae							2	1	3
" " w/o "			1				3	1	
L. hoffmeisteri									1
P. vejdovskyi							3		
Enchytraeidae									3
N. variabilis		4			1	2	1		
P. michiganensis								1	
S. appendiculata							1		
M. decepta						1			
V. sincera							1		
P. insigne							3		
Sphaerium									1
Hydracarina	2	1	9			5	2		3
Acari		1							
C. gracilis	2								
G. pseudolimnaeus							1		
H. azteca	1					1	2		
Asellus	1								
O. propinquus							1		
Baetis						1			
S. tripunctatum	1								
Caenis							4		
E. simulans							3		
H. brevis	1								
Ablabesmyia						1	4		1
Procladius							1		1
Thienemannimyia - gp.	1		1				1		
Procladius							1		1
Thienemannimyia - gp.	1						1		
Cryptochironomus					1		3	1	2
D. fumidus		4			5		3		1
M. caducus	1		1				14		
Pseudochironomus		13			10	1	2		
Stictochironomus							3		
Cladotanytarsus			1		1		32	1	2
Rheotanytarsus	1								
Stempellina							1		
Tanytarsus							4		3
Zavrelia							2		
C. bicinctus			1						
Cricotopus/Orthocladius		1			1				
Heterotrissocladius							3	1	3

Transect G4	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Nanocladius								1	4
Parakiefferiella sp.1							26	1	2
P. sp.2							5		
Pseudosmittia - gp.		22			17				

Transect G5	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Nematoda							22	34	109
imm. Tubif. w/o hr. setae					1		1	7	3
L. profundicola									1
P. ferox							1	2	1
Enchytraeidae				6	6	9	1		
N. bretscheri				6	60	15			
N. elinquis				1		2			
N. simplex				8		5		2	
N. variabilis	1	1		9	61	40			
P. osborni				14		1			
M. decepta	1			12	14	22			
Hydracarina					1	3	1	1	1
H. azteca			1						
Ablabesmyia						1			
Procladius					2	3	1		1
C. fluviatilis - gp.							3	1	
Cryptotendipes									1
D. fumidus		6	3		1	1			
M. caducus		1		1	11				
Parachironomus				1					
P. articaudatus	2	1	9	?10	3	7			
Stictochironomus									3
Cladotanytarsus		1	1	21	12	20		1	1
Micropsectra				30	4	6			
Tanytarsus		2		24	13	12	3	1	1
C. tremulus - gp.		2		3		1			
Heterotrissocladius				2	2	2		1	
Nanocladius								2	
Paracladius									1
Parakiefferiella sp.1				9	6	2			15
P. sp.2	2		1	4	7	1			
Pseudosmittia - gp.				1		3			

Transect G6		5 m 1	5 m 2	5 m 3	10m 1	10m 2	10m 3	20m 1	20m 2	20m 3
Rhabdocoela	s							1		
H. grisea	a	1	1							
Nematoda	m	1	1		23	2	8	126	49	238
M. speciosa	p							12	21	33
S. herringianus	l							3		5
imm.Tubif. w/hr. setae	e			2	3	5	8	3	2	6
" " w/o " "				6	22	19	15	24	12	55
A. americanus	l					3	2	1		1
A. limnobius	o				9	3	4			
A. piqueti	s				4	3				
A. pluriseta	t							1	1	2
L. hoffmeisteri									1	
P. curvisetosus										1
P. ferox								1		
P. moldaviensis								2		
P. vejdovskyi					14	1	5	2	2	5
T. ignotus						2	1			
Enchytraeidae							1			
N. variabilis							3	1		2
P. michiganensis							1			1
P. foreli					1					
V. intermedia								1		2
M. decepta		4	2		5	3	6			
V. sincera									2	
P. nitidium					6	2	1			(1)
S. rhomboidium			(1)			1		(1	1	2)
Anodonta						1				
Hydracarina		1	4		4	6	6			1
G. pseudolimnaeus			1			1				
H. azteca		1				1				
Caenis		2	17		5	3	5			
E. simulans			1							
Ceraclea		1								
Oecetis		1								
Procladius		1			5	3	3	3	1	5
Thienemannimyia - gp.			1							
Monodiamesa					2		2			1
P. longimanus - gp.									1	
C. fluriatilis - gp.						1		9	10	13
C. salinarius - gp.								2		
Cryptochironomus		2	3		6	1			1	
Cryptotendipes					10			1		
Harnischia								4	1	
M caducus		1	11							
M. pedellus					1	18	3			

Transect G6	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Paratendipes				1		5			
P. laetum			5						
P. scalenum		6	12	15	11	9			
P. fulviventris				6	4	3			
Stictochironomus		1	1		4				
Cladotanytarsus		1	23	79	96	77			2
Micropsectra		13				3			
Stempellina					1	1			
Tanytarsus			5	6	6	3	4	2	4
Zavrelia				1					
Epoicocladius			1						
Heterotrissoclaidus				2					
Nanocladius						1	2		1
N. cf. balticus			1						
Parakiefferiella sp.1					2	3			1
P. sp.2				1					
Synorthocladius			1	1					

Transect G7	5 m 1	2	3	10m 1	2	3	20m 1	2	3
H. grisea				2					
Nematoda	10	34	47	32	37	51	90	100	36
S. herringianus							3	2	
imm. Tubif. w/hr. setae			1						1
" " w/o " "	5	6	5	11	10	6	10	5	4
A. americanus			1						
A. limnobius							1		
P. ferox					1		2		6
Enchytraeidae									2
P. michiganensis	1	1	2	2	3	2			2
V. intermedia	1						1	3	4
G. livescens								1	
G. parvus							3	4	1
Lymnaea								1	
M. decepta								5	1
P. conventus							1		
P. nitidium							2	3	
P. ventricosum								1	
Sphaerium						2	8		2
Hydracarina				2	2	2	2	2	
G. pseudolimnaeus							3		1
Lirceus							12		
Procladius		2	3	3	1	2			
M. depectinata	(1		1)		(1)			1	1
Cryptochironomus	2	4	1	2	1	1			1
Demicryptochironomus			2	1					
Parachironomus							2		
P. undine		1					1		1
P. scalaenum				2	4	3			
P. simulans	13	16	8				4		1
Stictochironomus				1	2	1		2	
Cladotanytarsus	10	12	7	21	5	19	11	3	4
Stempellina				4					
Tanytarsus	3						18	7	5
H. changi	(2)			(1)			12	21	7
N. cf. balticus				2					
Parakiefferiella sp.1	1		4	8	6	2	2	4	2

Transect G14A	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Nematoda	83	34	19	22	16	17	8	1	2
imm.Tubif. w/hr.setae	1	1		1	1		4	3	1
" " w/o " "	9	3	3	10	3	5	3		3
A. americanus	2								
A. limnobius				1					
A. piqueti		1							
A. pluriseta				3					
P. ferox		3							
Enchytraeidae	1								
N. communis		1						1	
S. lacustris								1	
A. limosa		1							
G. parvus					6				
M. decepta	5	3					3	1	1
V. tricarinata							1		1
P. compressum	2								
P. insigne	2	2		1	1				
P. milium					1				
P. ventricosum		4							
Sphaerium								2	
H. azteca		4							2
Asellus		1							
Lirceus		2							
Caenis		4	1						
Ceratopogonidae	3		2						
Ablabesmyia		1			3		1		2
Procladius	7	2		1				2	2
Monodiamesa			2						
P. longimanus - grp.					1				
C. fluviatilis - grp.					2	3	1		
Cladopelma							1	1	
Cryptochironomus	3	2	2	2	1		2		
Cryptotendipes	20	8	2	5	3				
D. fumidus								1	2
D. modestus	2	2							
Parachironomus							1		2
P. undine		1							
Phaenopsectra		10		1	4		4	1	2
P. scalaenum	30	6	5						
P. simulans	18	3	3						
P. nr. tritum		1		2	1				
Pseudochironomus				1					
Cladotanytarsus	25	5	7				10	1	4
Paratanytarsus		6							
Tanytarsus	14	4	4	3	1		10	8	2
Heterotrissocladius	1								
Parakiefferiella sp.2		5							

Transect G14B	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
Nematoda	36	52	69	34	18	39	1	51	34
S. herringianus			2						1
imm.Tubif. w/hr. setae	1					1		1	6
" " w/o " "	3	2	2	4	7	5	1	4	6
A. americanus								1	2
L. newaensis								2	
P. freyi						1			
N. communis								1	
G. parvus									1
M. decepta	1		1					4	2
P. compressum		(1)		(2	1)			2	
P. insigne								7	5
Sphaerium		1	2						
Acari			2						
H. azteca								2	
E. simulans		1	2	1	1				1
Ablabesmyia				1					
Conchapelopia								1	
Procladius	2	2	4	5	6	1		3	2
Thienemannimyia - grp			1						
P. longimanus - grp.					1			1	1
Protanypus	1								
C. salinarius - grp.				4					
Cryptochironomus	3	4		3	2	4		3	
Cryptotendipes	5	14	35	6	1	9			
Dicrotendipes								1	
Endochironomus						1			
Paratendipes			2	1					
P. scalaenum		6	7	4	6	6		1	1
Pseudochironomus			1			1			
Cladotanytarsus	12	7	20	8	5	3		1	6
Stempellina						1			
Tanytarsus	2		7	2	2	1		1	2
M. changi					1	2		(1)	
Paracladius						1			
Parakiefferiella sp.1								4	6
P. sp.2	1	3	4	4	1	2			

Transect G14C	5 m			10m		
	1	2	3	1	2	3
Nematoda	33	3	12		7	24
imm.Tubif.w/ hr. setae	2		2	1		
" " w/o " "	31	10	5		6	8
A. limnobius	5					
A. piqueti					1	2
L. newaensis			1			
P. moldaviensis		1	2			
P. vejdovskyi	2	6	2			
P. michiganensis	1	1	1			
M. decepta	19		7		6	7
P. compressum			(2)			6
P. insigne	9	11	5		(3	2)
Hydracarina	21	8	2			
Paraleptophlebia		1				
S. tripunctatum		1				1
Caenis	2		1			3
E. simulans	10	14	5	1	5	6
Paracapnia		1		1		
Polycentropus		1				
Empididae	1		1			
Ablabesmyia	9	3	1		2	
Procladius	28		5	1	7	14
Monodiamesa	3				1	1
P. longimanus - grp.	1					
C. anthracinus - grp.				1	1	3
Cryptochironomus	33	7	5	2	13	11
Cryptotendipes					7	4
M. caducus	6	4	2			1
M. pedellus		1				
Nilotheuma		1				
P. undine					1	1
Paralauterbourniella	37	1	4	2	3	8
Phaenopsectra					1	
P. scalaenum	22	1	2	3	9	7
Pseudochironomus		3	4			
Stictochironomus					2	4
Cladotanytarsus	70	13	24	6	4	1
Stempellina	1		1			
Tanytarsus	44	3	8	4	6	20
H. hirtapex			1		3	1
Paracladius	1	1				
Parakiefferiella sp.1	14		4			

Transect G15A	5 m 1	5 m 2	5 m 3	10m 1	10m 2	10m 3	20m 1	20m 2	20m 3
H. grisea				1					
Nematoda	4	11	16	26	11	7	92	19	4
M. speciosa	1								
imm.Tubif. w/ hr. setae	3	2		1					1
" " w/o " "	2	6	1	4	4	1	9	4	8
A. americanus		1				1			
A. limnobius	1				1				
A. piqueti		2		3		1			
A. pluriseta	1		1						
P. moldaviensis	1				1	1			
P. vejdovskyi	1	1	1			1	1	1	
Enchytraeidae			1						
O. serpentina		1				1			
P. michiganensis							1		2
S. josinae							3		
V. intermedia							4		1
Aelosoma							1		
H. stagnalis		1							
M. decepta	1	1	1	3		1			
P. compressum			1	(2		1)			
P. insigne		(1	1)	5					
Lirceus					1	2			
Caenis		4		1					
Procladius	2	4		2		1	1		
M. depectinata	2	1			(1)				
C. anthracinus - grp.	4	7	3	1			6	1	1
Cladopelma	6	2	4			1			
Cryptochironomus			1	2		1	1	1	
D. fumidus	1	1							
M. caducus	1	1	1						
Parachironomus		6							
P. undine		2		1		3			
Phaenopsectra	1	4				3			
P. scalaenum			1						
P. simulans	2	1	2	1		5	2	1	3
Pseudochironomus			1						
Cladotanytarsus		1		3	1	1	6	1	
Paratanytarsus	1	2	2						
Tanytarsus	4	1	3	1		4	1		
Paracladius	1		2		1				
Parakiefferiella sp.1							2		

Transect G15B	5 m 1	5 m 2	5 m 3	10m 1	10m 2	10m 3	20m 1	20m 2	20m 3
Hydra		2							
D. tigrina		2	2						
Nematoda	2	4	5	13	8	5	41	46	51
Prostoma		1							
S. herringianus		3					1		1
S. eiseni	1								
imm.Tubif. w/ hr. setae	21	26	7	5	4	18			
" " w/o " "	18	15	18	3	2	3	2	2	2
P. moldaviensis	3	3	4						
P. vejdovskyi	11	3	17	2	2	1			
Enchytraeidae		1			2	2	1	1	
N. pardalis	1								
N. variabilis				1	1				
P. michiganensis	7	8	5	1					
P. longiseta	1		1						
S. appendiculata							2		
S. josinae	1						1		
S. lacustris							2		
V. intermedia							14	2	2
H. stagnalis	1	1	1						
N. obscura		1							
G. parvus	1		1						
M. decepta	1		2	2	1				
Physa		1	1						
V. lewisii								1	
P. insigne	1			2			(1)		
Hydracarina	5	5	3	12	2	1			
C. gracilis		1							
G. pseudolimnaeus	2	4	4						
H. azteca	3	4	3	1					
A. intermedius		1	6						
O. propinquus	1								
Paraleptophlebia	17	20	35						
S. tripunctatum		1	4	1					
Caenis	12	3	3	13	9				
E. bicolor			1						
E. simulans	9	8	11	4	2				
Leuctra		1							
Oecetis		1							
Polycentropus	3		3						
Ablabesmyia	4		3	1					
Procladius				1					1
Thienemannimyia - grp.	1	1	4						
M. tuberculata								1	3
C. anthracinus - grp.				3	4				
Cryptochironomus	4	4	5	3	12				
D. fumidus							1		1

Transect G15B	5 m			10m			20m		
	1	2	3	1	2	3	1	2	3
M. caducus	4	2	6						
M. pedellus					1				
Paratendipes	1		3	4	8	1			
P. simulans	2	1	1	1	11				
Pseudochironomus	6	8	3	16	14	1			
Stictochironomus	3	3	1	4	7	4			
Cladotanytarsus	9		10	43	48	2			
Stempellina				1	1				
Tanytarsus	2		3	4	3			4	
Zavrelia				2	2				
Corynoneura		3							
Cricotopus							1		
H. changi						(2)	1	2	1
Krenosmittia	1	1							
Nanocladius	1			4					
Parakladius									1
Parakiefferiella sp.1							5		
P. triquetra							1		
Pseudosmittia	1		2						
Synorthocladius		2							
Thienemanniella			1						

Transect G15C	5 m			10m			Station G161		
	1	2	3	1	2	3	1	2	3
Nematoda	8	2	4	7	3	1	13	11	14
S. herringianus		2		4		2			
imm.Tubif. w/ hr. setae	6	3	4	6		4	4		1
" " w/o " "	2	6	5	13		7	9	6	11
P. moldaviensis	1		1						
P. vejdovsky	8	3	2				2	1	
Enchytraeidae		1			1	1		3	
P. michiganensis	5	3	2	1		2	1	1	2
P. longiseta				1			1		
H. stagnalis	2								
Ferrissia				1				1	
G. parvus		1					2		
M. decepta	1						2	6	8
V. sincera				3					
Pisidium		2		3		2			
P. ventricosum			1						
Acari		1	1						
Hydracarina	1	9	3	4		5	2	3	
G. fasciatus									1
G. pseudolimnaeus	1	1				1			
H. azteca				5		1		1	
Baetis							1		
Paraleptophlebia	1			1					
S. interpunctatum						1			
Caenis				5		11	19	10	5
E. bicolor		1							
E. simulans		1		3		3	2	3	2
Polycentropus	1			1					
Stenelmis	2								
Ceratopogonidae							1	1	2
Empididae									1
Ablabesmyia	12	8	1	1			3	4	2
Procladius							1		
Thienemannimyia - grp.	3						2	7	
Monodiamesa							1		
P. longimanus - grp.							1		
Cryptochironomus	14	3	4	1		2	13	5	9
Cryptotendipes	2								
D. fumidus							26	22	4
M. caducus	1		2	13		18			
M. pedellus		1					5	6	2
Nilothauma	1	1							
P. scalaenum				3		2	92	31	14
P. simulans	15	31	4	1				2	4

Transect G15C	5 m			10m			Station G161		
	1	2	3	1	2	3	1	2	3
P. fulviventris	(1	5)		3		2	(3	1)	
Stictochironomus	1	3	2	4		3	12		
Tribelos						1			
Cladotanytarsus	24	53	3	41		35	275	93	115
Micropsectra							55	16	15
Paratanytarsus							11	7	12
Tanytarsus	2	5		3		2		10	
Zavrelia	2							7	
Cricotopus				1	4				
Epoicocladius								4	1
Heterotrissocladius						1			
Nanocladius		1							
N. cf. balticus						1			
Parakiefferiella sp.1		2							
P. sp.2							11	12	11
Pseudosmittia							4	5	

Station	G16-2			G16-3			G16-4			G16-5		
	1	2	3	1	2	3	1	2	3	1	2	3
Hydra			3									
D. tigrina							1					
Nematoda			1		7	3			1	47	53	29
Prostoma					1							
S. herringianus				1				16	2			
imm.Tubif. w/ hr. setae					3	2				2		
" " w/o " "	1			1	15	6				2	3	4
A. limnobius							1					
P. vejdovskyi				4	2	1					1	
Enchytraeidae						1						
N. bretscheri					1							
N. communis			1									
N. variabilis			1	2	3							
P. michiganensis				1	2	3				1	4	
P. foreli					1							
S. appendiculata				1								
Aelosoma				1								
G. parvus							1		2			
M. decepta					2	1	1					
Physa							5	2	5			
V. sincera				1	1							
Acari				2								
Hydracarina				5	8	2						1
G. lacustris							10		5			
H. azteca		1						1	2			
A. intermedius	3						50	6	12			
Lirceus						1						
S. interpunctatum									1			
S. tripunctatum							2		1			
Caenis				2	2	6						
E. simulans					3	2				1		
Cheumatopsyche							1					
Polycentropus						1						
Empididae		1	1									
Ablabesmyia					1							
Thienemannimyia - grp.				1	1			1				
Monodiamesa										1		
Cryptochironomus					3					2	1	1
Cryptotendipes										3		
D. fumidus				2	1				1			
M. caducus				1	1	1	1					
M. pedellus				6	16	7						
Paracladopelma											1	

Station	G16-2			G16-3			G16-4			G16-5		
	1	2	3	1	2	3	1	2	3	1	2	3
Phaenopsectra					1							
P. scalaenum				6	12	8				2	5	4
P. simulans										4	2	6
P. fulviventris				3	4							(1)
Stictochironomus					4							
Cladotanytarsus			1	72	103	25	1			4	9	5
Micropsectra				6	14	4						
Tanytarsus	1		2	3	4	5						1
Zavrelia				8		1						
Cricotopus	1		1		1							
Parakiefferiella sp.1			1	5	7							
Psectrocladius					1							
Pseudosmittia - grp.	4		9	1	3				1			

Transect G26	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Hydra				1					
H. grisea				2					
P. fluviatilis						1			
Nematoda	3	15	12	11	13	59	9	1	14
Prostoma	1	3	7	2					
M. speciosa		11	5	5	10	23	7		4
L. variegatus			1						
S. herringianus				2	2	5			
imm.Tubif. w/ hr. setae	4	8	9		1	2	3	3	
" " w/o " "	5	7	5	2	2	8	4	5	
A. americanus			2				2		
A. piqueti								1	
A. pluriseta							2	1	
P. ferox	2	3	4		7	3	2	1	
P. vejdovskyi	6		1						
Enchytraeidae		3	2	1		8			
Amphichaeta					2	1			
C. cristallinus		1	1				1		
C. diaphanous						1			
N. communis			1						
N. simplex					1				
N. variabilis				3					
P. michiganensis	4	10	7	3	5	6			
P. foreli		15	37	2	1	3			
P. longiseta			10						
S. appendiculata	2	3	6		1				1
S. josinae	1	1							
S. lacustris						3			1
V. intermedia		2	9			1		2	
Aeolosoma			1			1			
Ferrissia	3								
G. parvus		6	18						
M. decepta		21	38	1	1				
Physa					1				
P. exacuous		2		1	1				
V. sincera	1	14	18		1	3			
Pisidium	4	6	14	3	3	8	3		1
Tardigrada			1						
Acari		4	1						
Hydracarina	3	16	5		3				
H. azteca		7	4		3				
P. hoyi					1	5			1
Asellus	1	1							
Caenis			1						

Transect G26	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
E. bicolor		1							
E. simulans	1		1		1	1			
Oecetis			3						
Ceratopogonidae		1							
Ablabesmyia	1	3							
Larsia	4	20	11	3		1			
Procladius		1	2		2		3	2	2
Thienemannimyia - grp.		2	1						
M. tuberculata								1	
P. longimanus - grp.						1			
Cryptochironomus	3	13	10	2	4	3			
Endochironomus		1	1						
M. caducus	2	1	2		1				
P. rollei			1						
Paracladopelma						2			
Paralauterbourniella		6	5						
Phaenopsectra	4	3			1				
P. flavipes		1							
P. scalaenum	3	2	3				1		
Pseudochironomus	1				1				
Stictochironomus				1		1			
Cladotanytarsus		60	52	2	2	6	1		
Stempellina			1						
Tanytarsus	9	22	65	2	12	5	3	2	3
Zavrelia	1								
Heterotrissocladius	1	12	4			2	1		
Nanocladius			1			1			
Parakiefferiella sp.2	2	20	19		2	3			
Psectrocladius		1	2						
Pseudosmittia		1	2						
Synorthocladius	2	1							
Thienemanniella			1						

Transect G27	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Hydra									1
H. grisea	2								
D. tigrina			2						
Nematoda			1				2		
M. speciosa							1		
imm.Tubif. w/ hr. setae							4		
" " w/o " "	15						2	1	
A. pluriseta							27		
P. ferox	1		4				1	2	
P. vejdovskyi	3								
T. ignotus			1						
A. lomondi							1	1	
C. diaphanous								1	
N. communis	1								
N. variabilis	2								
P. foreli	4								
S. appendiculata	6	1	2	2	2		3	9	2
S. fossularis			1						
S. lacustris	2	2	2		5	3	1	1	1
V. intermedia	1							5	
A. limosa		1							
G. livescens	1		7						
G. parvus			1	3	8	7		1	2
H. trivolis				1					
Lymnaea	1	1	7		5	5			
M. decepta	5	1	5	7	3	3		1	5
Physa			1			2			
P. acuta			2						
V. lewisii				1			1	1	1
V. sincera		1	1	8	6	4			
V. tricarinata				1		3			
P. subtruncatum			2				(11	6	1)
S. simile			2						
Hydracarina	2	4	15	1	1	1	1		1
H. azteca			2		3	2			
E. bicolor			1						
Hydroptilidae		2							
Lepidosoma			1						
Larsia	4		1						
Procladius			1				1	2	
Thienemannimyia - grp.	1								
Cryptochironomus			2						
D. fumidus			1						

Transect G27	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
M. caducus			3						
Paracladopelma								1	
Paratendipes			4						
P. laetum			1						
Cladotanytarsus								1	
Tanytarsus			1				5	1	
Heterotrissocladius			1						
Nanocladius			1						
Parakiefferiella			(2)					(1)	
Pseudosmittia					1	1			

Transect N11	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Phagocota		1							
Nematoda		2	1			1	5		5
S. herringianus		3		6	4		7	2	5
imm.Tubif.w/o hr. setae							2		
A. americanus							2		
P. ferox					1				1
Enchytraeidae					1		1		
C. diastrophus			1						
N. simplex						1			
N. variabilis	3								
P. michiganensis		2							
P. foreli				1	1	1			
S. appendiculata		1		2		1	1		
S. fossularis									1
S. lacustris				1		2			
V. intermedia					2	1			
G. parvus				2	3				
Physa				1	1				
V. lewisii							1		
V. sincera				1	1				
P. ventricosum							1		2
Sphaerium				1				1	
Hydracarina		1	2	1	3	3			1
H. azteca	3		2	5	7	22			
A. forbesi				1	1	1			
Paraleptophlebia				9	4	3			
Hastaperla					1				
Molanna					1				
Hydroptilidae		1	2						
Polycentropus						1			
Ablabesmyia	3	7	1	10	13	2			
Procladius									1
Thienemannimyia - grp.		1		3					
P. longimanus - grp.	1								
Syndiamesa			1						
Cryptochironomus				2		1			1
Dicrotendipes	2		1		1				
M. caducus	1				1				
Pseudochironomus	3	1	4	1					
Cladotanytarsus	2		5						
Stempellina									1
Tanytarsus			1	2	3	1	1		
Cricotopus				1		1			

Transect N11	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
H. hirtapex							4		3
Orthocladius	4	2	1						
Parakiefferiella			1	1	1				
Psectrocladius		1							
Pseudosmittia - grp	6	2	6		5				
Thienemanniella				1					

Transect N12	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Nematoda				2	12	5			s
S. herringianus					1		1		a
S. eiseni				1					m
imm.Tubif. w/ hr. setae	5		3	4	5				p
" " w/o " "	1		5	4	5	1		2	1
P. vejdovskyi			1	1					e
Enchytraeidae					1		3		
C. diastrophus					1			1	1
N. communis									o
P. michiganensis	7	1	3	4	4	3			s
P. foreli					10				t
Un uncinata				1					
A. limosa				1					
G. livescens		1							
G. parvus		1							
M. decepta	2			1	1				
V. sincera			4	2	3	1			
V. tricarinata		1							
Pisidium			1						
Hydracarina	2		4	1	2				
C. gracilis		2		1					
H. azteca	1				1				
Asellus			1						
Caenis	1	1	5	1	1	1			
E. simulans			1	1					
Ceraclea		1							
Oecetis				1					
M. longicornis				1					
Ablabesmyia	4	3	7						
Larsia				1	5				
Thienemannimyia - grp.	4								
Monodiamesa					2	1			
Cryptochironomus	5			3	6	2			
Cryptotendipes				4	4	2			
M. caducus	1	1							
Paracladopelma					1				
P. scalaena	1		2	22	12	4			
Pseudochironomus		1							
Stictochironomus			1	2	1	1			
Cladotanytarsus				16	39	4			
Stempellina	1			1	5				
Tanytarsus	1								
Heterotrissocladius					11	2			
Parakiefferiella			1	5	3	1			
Pseudosmittia- grp.		1	1						

Transect N13	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Hydra				2					
H. grisea			2	2					
Phagocota					1				
Nematoda	4	37	11	16	2	3	25	66	97
L. variegatus				1					
S. herringianus	4	7	3	14	7	6	1	6	3
imm.Tubif. w/ hr. setae	2	2		9	1	5			1
" " w/o " "	2	14	1	26	6	8	1	2	3
A. pluriseta		2							
P. ferox	4	12	5	19	3	7	3	5	7
P. moldaviensis			1						
P. vejdovskyi									2
Rhyacodrilus				1					
Enchytraeidae		2		2			1		
N. variabilis		1							
P. michiganensis	2	2							
S. appendiculata	1			22	14	5			
S. lacustris		3	4		2				
U. uncinata				4	1	1	1		3
V. comata					1				
V. intermedia	5	6	5	14	4	4			3
H. fusca				5	1				
G. parvus	6	5	4	9	6	1			
Lymnaea	1	2	5	2	4				
M. decepta	3	5			1	2			
Physa		6	2			2			
V. sincera	1	1		2	3	1		1	2
V. tricarinata	2	3	7						
Pisidium		6		1		2			1
P. insigne	2	4	3				2	3	3
Hydracarina	5	1	2	5	3	2	1		
C. gracilis					1				
H. azteca	2	7	4	1	5				
P. hoyi							5	11	13
Asellus				1	1				
Lirceus	2	12	1		2				
Paraleptophlebia	5	6	1						
Ephemerella					1				
Stenonema	1								
Caenis	2	2			1				
Isoperla		1							
Oecetis			1	1		1			
Hydroptilidae		3			1				
Lepidosoma		1							

Transect N13	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Ceratopogonidae		1							
Ablabesmyia		2	1	13	4	6			
Larsia						2			
Thienemannimyia - grp.		3							
M. depectinata		5	1						
P. longimanus - grp.	1	3				1			
Protanypus							1	2	1
Cryptochironomus	1			7	1	6			
Cryptotendipes				3					
Dicrotendipes		6		5	1	5			
Endochironomus				4	1				
M. caducus				2	1				
Parachironomus	1								
Paracladopelma	1	3	3						1
Phaenopsectra				1					
P. scalaenum		2							
Cladotanytarsus	3	3	6	6	3	3			
Micropsectra	2								
Paratanytarsus		4							1
Rheotanytarsus	1	2							
Tanytarsus		2	4	12				1	
Zavrelia		1							
Corynoneura			2		5	1			
Cricotopus		1		1					
Heterotrissocladius	5	15	5	12	1	8			2
Nanocladius	5	4	5	2	2	1	1	1	5
Parakiefferiella	21	27	19	25	7	14			
Psectrocladius					1				
Pseudosmittia				1					

Transect N14	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
H. grisea		1							
Nematoda	2	7	3	2	2	14		1	8
M. speciosa	14	31	1	1	2	5			
L. variegatus					1				
S. herringianus				8	3	2			
imm.Tubif. w/ hr. setae	2	3	2			1	3	2	6
" " w/o " "	2	7		1	6		3	1	1
A. americanus				1		1			
A. piqueti		4							
P. ferox	2	2	1	2	14	1			
T.k. americanus					2				
A. lomondi	1	19							
N. communis		2			1				
P. idrensis		1							
S. appendiculata		2		1					
U. uncinata			1						
G. parvus					1				
Lymnaea				1					
M. decepta			5						
Physa			1						
V. lewisii				1					
V. sincera				5	4				
V. tricarinata	1		1	1				2	
Pisidium	2	2			1	1	3	1	2
P. insigne				1	3	3			
Sphaerium	8	1	1						
L. radiata		1							
Hydracarina	2	5	2						
C. gracilis					4		1		
G. fasciatus		1							
H. azteca	2	2	26						
P. hoyi				3			1	14	11
A. racovitzai				2	8	10	1		
Caenis	1		5						
E. simulans		7	5						
H. limbata	3	30	4		1				
Sialis	1	1							
Polycentropus			1						
Ceratopogonidae	5		4	1					
Ablabesmyia			4						
Clinotanypus	1	1	1					1	
Larsia	4	2		1					
Nilotanypus	1								
Procladius	21	34	11		2	2			

Transect N14	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Protanypus								1	
Cryptochironomus						1			
Cryptotendipes		2	1						
D. fumidus		(4)			2	1			
D. neomodestus					1				
Endochironomus	5								
Harnischia	1	11							
Paratiella	7	14	5						
Paracladopelma	1								
P. simulans		2	1						
Cladotanytarsus	4	20	3						
Stempellina		1							
Tanytarsus	10	12	1	1	5	1			
C. isocladius					2		1		
Krenosmittia		1							
Nanocladius	2	4							
Parakiefferiella									1

Transect N15	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
H. grisea		1			1				
Nematoda	14	10	22	1	5	12	1	4	
M. speciosa					4	6	2		
imm.Tubif. w/ hr. setae	1	2							
" " w/o " "	8	12	11		8	45	1		2
A. americanus					2	1			
P. ferox									1
Enchytraeidae	1	1	1						
A. lomondi						1		1	
P. michiganensis					1				
P. foreli			2			1			
S. josinae	1		1	4		3			
S. lacustris							1		
G. parvus					1				
Lymnaea	1	1	1						
M. decepta		2	1						
v. sincera		1	1			3			1
V. tricarinata		1			2		1		
Pisidium	1	6	2		1	1	3	1	1
L. radiata						3			
Hydracarina		2	1			1	1		
C. gracilis				1					
P. hoyi							3	8	5
Caenis		1							
E. simulans	1		2			1			
Hexagenia		1	7		3	6			1
G. lividus					1				
Oecetis					1	1			
Ptilostomis		1							
Phylocentropus						1			
Ceratopogonidae		1		3	1	2			
Clinotanypus		1							
Labrundinia									1
Procladius	8	24	18	2	12	13			1
M. depectinata		1	4		1				
Cryptochironomus		3	4		2	3			
Cryptotendipes	26	14	16						
D. fumidus					2		1		
D. neomodestus						1			
Endochironomus			2						
Parachironomus					2	1			
Paracladopelma					1	2			
Paralauterbourniella						1			
P. scalaenum			4			1			1

Transect N15	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Pseudochironomus	1	4	1		4	1			
Stictochironomus	2	4	2						
Cladotanytarsus	5	11	11			5			
Paratanytarsus	1								
Tanytarsus	2	3	1		1		1		1
Zavrelia								1	
Cricotopus					1				
H. latilaminus			1		(1)				
Krenosmittia		1							
Nanocladius		9	11		2	2		1	
Paracladius	1					1			
Parakeifferiella	2	1			1				

Transect N16	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
H. grisea	5	4	1		2	1			
Nematoda	6	26	21	12		10	1	3	2
M. speciosa	1	1	2			2			
imm.Tubif. w/ hr. setae			3					1	1
" " w/o " "	2						1	2	2
A. limnobius				5	3	13			
P. ferox	2		1						
G. parvus	1	2	1						
M. decepta	5	3	1						
C. sincera	1	3	5			1			
V. tricarinata	5	2	1						
M. transversum		3							
Pisidium	10	7	8					6	2
Sialis			1						
Chaoborus			1		1	5		1	
Procladius							1		3
Protanypus									1
Cladotanytarsus				1					
Parakiefferiella			1						

Transect N17	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Nematoda	41	42	40	34	15	12	1	4	2
M. speciosa	12	11	11						
S. herringianus		3	7		1			2	
imm.Tubif. w/o hr. setae	2	2	1					1	
A. americanus							1	1	
A. limnobius		1							
P. ferox	3	9	2				2	2	7
Enchytraeidae			1	6		3			
C. diastrophus						1			
P. michiganensis				1					
P. foreli						1			
P. idrensis				1	5	1			
M. decepta	5	4	5						
V. sincera	1	2	5						
V. tricarinata				1		1			
Pisidium	5	8	5					3	1
Hydracarina	1	1	1						
P. hoyi		1			1	2	4	5	2
S. lineata			1						
Procladius	1								
Cryptochironomus	1	4	2		1				
Demicryptochironomus		1							
Pseudochironomus		1							
R. demeijerei				4	5	3			
Cladotanytarsus	2	2	6	2	1				
Tanytarsus	2				1				
Cricotopus				1					
H. latilaminus		5	2						
Parakiefferiella	1	1		1		1			

Transect N18	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Hydra				1					
Phagocota	3	1							
Nematoda	11	29	7	12	4	12	8	11	4
Aelosoma		2							
S. herringianus	4	4		2	4	1			
imm.Tubif. w/ hr. setae	4	8	2	4	1	3			
" " w/o " "	6	12	4	29	1				
A. americanus			1	2					
A. limnobius	1		1						
A. pluriseta			1						
L. hoffmeisteri							1		
P. ferox	3	6	2	14	7	8			
P. moldaviensis				1					
P. vejdovskyi					1				
T. ignotus				41	1				
Enchytraeidae	1	2	1		1	1			
A. lomondi				2					
C. diaphanous		1							
N. communis	1			1					
N. variabilis		2	0	3	1				
P. michiganensis	1					1			
P. foreli	11	10	7			1			
P. idrensis	1	1	3						
S. appendiculata	2	1	2	7	1				
S. josinae	2	1	1	1					
S. fossularis							1		1
U. uncinata		1			1				
V. intermedia	4	7	5	16	1	4	2	2	1
H. stagnalis		3		1	2				
G. paruvs	4	14	5	10	2	7			
H. trivolis				1		1			
Lymnaea		1	1	2					
M. decepta	6	20	1	20	6	5			
P. exacuous		1			1				
V. lewisii				2					
V. sincera				10		6			
V. tricarinata						1			
P. isidium	3	3		2	2		6	2	1
Acari		2	2						
Hydracarina		7	1	11	5	1			
H. azteca			1		1				
A. racovitzai					4				
Lirceus					4	1			
Paraleptophlebia	3	2	1						

Transect N18	5 m			10m			20 m		
	1	2	3	1	2	3	1	2	3
Caenis	3	3	2						
E. simulans	5	6	4	1					
Oecetis		1							
M. longicornis		1	1						
Ceratopogonidae	1		2						
Empididae		1							
Labrundinia		1	2						
Larsia	4	1	1		9	1			
Nilotanypus				2					
Procladius	3	7	1						
P. longimanus - grp.		1		1					
Cryptochironomus	5	10	2	1	1	3			
Cryptotendipes				2					
D. fumidus	2			2	5	1			
D. neomodestus				5	2	2			
Endochironomus		12	4	2					
Microtendipes	2	1		3	3	1			
Parachironomus		1		2		1			
Paracladopelma		5	1	5	1	1			
Polypedilum	1								
Stictochironomus	11	1	1	1	1	2			
Cladotanytarsus	12	52	20	45	13	12	1		
Stempellina	2	11	1	2					
Tanytarsus	26	82	40	25	5	10		2	
Zavrelia		4		3					
Corynoneura		1							
Heterotrissocladius	9	13	6	11	6	6			
Nanocladius	3	9	3	5	1	3		1	
Parakiefferiella		13	8	5	2	10			

										Station NB		
	10m			20m			10ma			10m		
Transect NA	1	2	3	1	2	3	1	2	3	1	2	3
Hydra	3	1										
H. grisea	1											
D. tigrina	2		2									
Prostoma		1	1									
Nematoda	5		6	6	7	6	11	32	8	4	9	15
M. speciosa			3				2	1				1
S. herrignianus		1	2									
imm.Tubif. w/ hr. setae	3	11	5	4		3		2	1			
" " w/o " "	1	3	4	2	2	1	1	1		5	1	
A. americanus							1					
A. limnobius	6	1	3									
A. piqueti		5	1	1								
A. pluriseta	4	2	1									
P. ferox	1		6				3	1				
P. freyi							1					
P. moldaviensis						1						
P. vejdovskyi	2		1	1		1		2				2
Enchytraeidae	1											
A. lomondi	1											
C. diaphanous	1											
P. foreli	2											
R. parasitica	6		7									
S. appendiculata	8	13	7									
S. josinae	5	3	1									
S. lacustris		1	2									
V. intermedia	3	10	4			1						
G. parvus	1											
M. decepta	19	5	22					1	1			
V. sincera	14	5	13									
Pisidium	3		7	1								
Acari			1									
Hydracarina	15		7									
G. fasciatus	1											
H. azteca	1											
P. hoyi				1	1					2	2	1
Lirceus	1											
Paraleptophlebia	3											
Heptagenia			4									
Caenis	3		1									
E. simulans	3		1									
H. atrocaudata								2	1		2	
Sialis						1					1	
Oecetis			1							1		

	10m			20m			10ma			Station NB 10m		
Transect NA	1	2	3	1	2	3	1	2	3	1	2	3
Ceratopogonidae	1											
Larsia	1		1									
Procladius		1	2	1		1	2	2				
Thienemannimyia - grp.		1										
P. longimanus - grp.			2									
C. fluviatilis - grp.			1									
Cladopelma			3									
Cryptochironomus	11		2					1			1	
D. fumidus		1										
D. neomodestus	1								1			
Endochironomus		1						2				
Microtendipes	4		1									
P. undine								1				
Paratendipes	1	2										
P. scalaenum		2	1					1				
Stictochironomus			2									
Cladotanytarsus	2		3				1					
Stempellina			1									
Tanytarsus		4	12				1				1	
Zavrelia		1										
H. changi								2				
Parakieferiella	2		1									